VOL 14, No. 1 JANUARY, 1937

RECEIVED
JAN 13 1937
U. S. P. H. LIBRARY

The AMERICAN JOURNAL of OPTOMETRY

EDITORS

CAREL C. KOCH JACK I. KURTZ

COLLABORATORS

EARL ALLGAIER, *Ames, Iowa*
J. FRED ANDREAE, *Baltimore, Md.*
J. O. BAXTER, JR., *Fayetteville, N. C.*
J. O. BAXTER, SR., *New Bern, N. C.*
L. L. BEACHER, *New York, N. Y.*
ROBERT J. BEITEL, JR., *Southbridge, Mass.*
ROBT. T. BEST, *Fairmont, Minn.*
W. I. BROWN, *New Bedford, Mass.*
J. T. CAMPBELL, *Washington, N. C.*
BRANT CLARK, *San Jose, Calif.*
J. ROBINSON COHEN, *New York, N. Y.*
PAUL DILL, *Greeley, Colo.*
HOWARD C. DOANE, *Boston, Mass.*
J. H. DRAKEFORD, *New York, N. Y.*
G. L. DUPLESSIS, *Minneapolis, Minn.*
ISRAEL DVORINE, *Baltimore, Md.*
T. H. EAMES, *West Somerville, Mass.*
WM. FEINBLOOM, *New York, N. Y.*
L. P. FOLSOM, *South Royalton, Vt.*
HARRY LEE FORDING, *Portland, Ore.*
W. H. GLAZER, *Philadelphia, Pa.*
R. M. HALL, *Cleveland, Ohio*
C. J. HATHAWAY, *Pontiac, Mich.*
C. K. HAYNES, *Jamestown, N. Y.*
NO MAN B. HAYS, *Niagara Falls, N. Y.*
W. JEROME HEATHER, *Chicago, Ill.*
WM. HENNING, *Fargo, No. Dak.*
ARTHUR E. HOARE, *Los Angeles, Cal.*
H. S. HORTON, *Cleveland, Ohio*
E. E. HOTALING, *New York, N. Y.*
J. F. HURWITZ, *New York, N. Y.*
E. A. HUTCHINSON, *Los Angeles, Cal.*
CHARLES E. JAECKLE, *Newark, N. J.*
H. D. JUDD, *Detroit, Mich.*
BESSIE E. KEHL, *St. Louis, Mo.*
L. H. KRASKIN, *Washington, D. C.*
ALVHH H. LAUER, *Ames, Iowa*
C. V. LYONS, *San Francisco, Calif.*
G. A. MACELREE, JR., *Philadelphia, Pa.*
F. L. MASON, *Berkley, Calif.*
D. J. MAYER, *Riverside, Calif.*
O. L. MCCULLOCH, *Holyoke, Mass.*
F. MCFADDEN, *Rutland, Vt.*
O. J. MELVIN, *Omaha, Nebr.*
WILLIAM B. NEEDLES, *Chicago, Ill.*
JOHN C. NEILL, *Philadelphia, Pa.*
J. F. NEUMUELLER, *Woodbury Heights, N. J.*
G. O. OHLSSON, *Detroit, Mich.*
C. R. PADELFORD, *Fall River, Mass.*
D. R. PAINE, *Topeka, Kansas*
R. J. PEARCE, *Greensboro, N. C.*
RAY MORSE-PECKHAM, *Detroit, Mich.*
GEO. A. PERKINS, *Ord, Nebr.*
ERNEST PETRY, *Rochester, N. Y.*
HARRY E. PINE, *Chicago, Ill.*
S. M. ROBINSON, *Prescott, Ariz.*
E. LEROY RYER, *New York, N. Y.*
H. LESLIE SALOV, *Newark, N. J.*
Z. J. SCHOEN, *University, Virginia*
CHARLES SHEARD, *Rochester, Minn.*
CARL SHEPHARD, *Chicago, Ill.*
R. E. SIMPSON, *Pasadena, Calif.*
WILLIAM SMITH, *Roxbury, Mass.*
H. RILEY SPITLER, *Eaton, Ohio*
M. STEINFELD, *Paducah, Ky.*
EDWIN F. TAIT, *Philadelphia, Pa.*
WILLIAM J. TAIT, *Philadelphia, Pa.*
S. S. TITUS, *Kansas City, Mo.*
W. O. VIVIAN, *Media, Pa.*
R. N. WALKER, *Winston-Salem, N. C.*
A. D. WHEELOCK, *Des Moines, Iowa*
A. WHITAKER, JR., *Bridgetown, N. J.*
E. G. WISEMAN, *Buffalo, N. Y.*
ARENE T. WRAY, *Los Angeles, Calif.*
LLOYD K. WYATT, *Peoria, Ill.*
N. A. ZEVIN, *Philadelphia, Pa.*

QP
474
A512

Published Monthly by the AMERICAN JOURNAL OF OPTOMETRY PUBLISHING ASSOCIATION,
1501 Foshay Tower, 821 Marquette Ave., Minneapolis, Minn.

ANNUAL SUBSCRIPTION $4.00. CANADA $4.50, FOREIGN $5.00
Single copies, 50c.

Entered as second-class matter February 20, 1924, at the postoffice at Minneapolis, Minnesota, under the Act of March 3, 1879.

READ THE

AMERICAN JOURNAL OF OPTOMETRY

You cannot afford to miss the articles which will appear during the year of 1937.

These are only a few of the many articles which will appear in this Journal:

Dr. Laurence P. Folsom—Professional Personality.

Dr. William Feinbloom—A Plastic Contact Lens.

Drs. E. Leroy Ryer and Elmer E. Hotaling—A New Lens for Preventing Cataract.

Dr. A. R. Reinke—Form Motion and Color Fields as Applied to Practice.

Dr. Laurence P. Folsom—The Element of Personality in Professional Economics.

Dr. R. M. Hall—Report on Amblyopia and Subnormal Vision.

Dr. Carel C. Koch—Graphic Record Charts.

Dr. W. S. Farmer—The Practical Application of Fusion, Accommodation and Adduction Relation at Near Point.

Dr. George A. Parkins—A Practical Approach to the Slow Reader Problem in Schools.

Dr. H. Riley Spitler—Syntonic Case History, Methods and Application.

Dr. Robert J. Beitel, Jr.—A Method of Subjective Refraction Theory and Technique.

Dr. William Feinbloom—After Images.

Dr. Brandt Clark—Photographic Measures of Accommodative Convergence.

Dr. William J. Tait—Measurement of Visual Acuity.

Dr. Louis H. Kraskin—The Influences of Emotional Disturbances on the Eye.

Dr. Jack I. Kurtz—A Photographic Study of Ocular Fatigue.

——————Use this coupon. Clip and mail today——————

AMERICAN JOURNAL OF OPTOMETRY
1502-4 Foshay Tower, Minneapolis, Minn.

Send the "JOURNAL" for one year to

Name _____

Address _____

Yearly Rates

☐ Single Subscription or Renewal **$4.00**
☐ One New Subscription and one Renewal **7.00**
☐ Single Renewal for two years **7.00**

Check, M.O., Draft for the amount of $_____ is inclosed.

Signature _____

Address _____

QP
474
A512
V.14,no.1

AMERICAN JOURNAL OF OPTOMETRY

Vol. 14 JANUARY, 1937 No. 1

CONTENTS

ORIGINAL PAPERS

An Opinion on the Meaning of Colored Miral Reflexes and on Myopia. James H. Drakeford 1

Further Studies of the Fusional Convergence Amplitude. Part III. William J. Tait 4

Color, Motion and Form Perception Fields. A. R. Reinke 12

Differentials in Heterotropia. R. M. Hall 21

EDITORIALS

Illustrated Record Charts in Optometric Examinations. Carel C. Koch 25

CORRESPONDENCE

Discussion of Lens Effectivities of Distance Corrections at Differing Near-points. Ernest Petry and James O. Baxter, Jr. 34

ABSTRACTS

The Correction of Aniseikonia with Ophthalmic Lenses. Kenneth N. Ogle. Abstract by Ray Morse-Peckham 37

BOOK NOTICES

Wills Hospital Eye Manual for Nurses. Gladys E. Cole 40

The Fundamentals of Chrome-orthoptics. William Henning . . 40

IN RIMLESS THE

swing is to

No rimless mounting in late years has aroused more favorable comment or won for itself more enthusiastic response than Ful-Vue Ramsey Tri-Flex. And small wonder . . . for Ful-Vue Ramsey Tri-Flex offers three advantages available in no other mounting—the "invisible endpiece" . . . Tri-Flex Spring construction . . . and No-Scru.

Measured in the cold terms of actual performance these three advantages mean the elimination of bulky, conspicuous endpieces—the reduction of lens breakage to an absolute minimum—and a flexibility of strap that preserves perfect alignment. More than enough to justify the choice of Ful-Vue Ramsey Tri-Flex as Rimless Favorite Number One.

In addition, Ramsey Tri-Flex is offered in a wide range of seven smart styles. Its longer endpieces, which allow greater adjustability, eliminate the poor fit and unsightly bends common to ordinary endpieces. Moreover there's a greater margin of profit to be had in fitting Ful-Vue Ramsey Tri-Flex. Ask to see all seven styles.

ALL
FUL-VUE
RAMSEY STYLES
FEATURE
TRI-FLEX AND
NO-SCRU

AMERICAN OPTICAL

FUL-VUE RAMSEY TRI-FLEX

FUL-VUE RAMSEY TRI-FLEX 3EFRD1493

Company

TITMUS

PERFEX LENSES

FAMOUS THROUGHOUT THE PROFESSION FOR

QUALITY

From every branch of the Profession comes commendation of the uniform quality and precision of Titmus ophthalmic lenses. Doctor, fitter and optical technician share with the patient the fruits of manufacturing care and accuracy.

The Titmus Optical Company, Inc.
Independent Manufacturers of Perfect Quality Ophthalmic Lenses
PETERSBURG, VIRGINIA, U. S. A.

BACK NUMBERS WANTED

The library of the Ohio State University is anxious to complete its files of the American Journal of Optometry. They are in need of these numbers:

Vol. 7, No. 1
Vol. 8, No. 5
Vol. 9, 1, 2 and 3
Also Vol. 1 to 6 inclusive.

If you can spare any of these numbers mentioned please communicate with the

American Journal of Optometry
1202 Foshay Tower
Minneapolis, Minnesota

Have You Moved?

Send us Your New Address, In Order That You May Receive Your Journal Regularly.

American Journal of Optometry

SYMMETRO-PRISM BIFOCALS

Comfort
Beyond
Expectation!

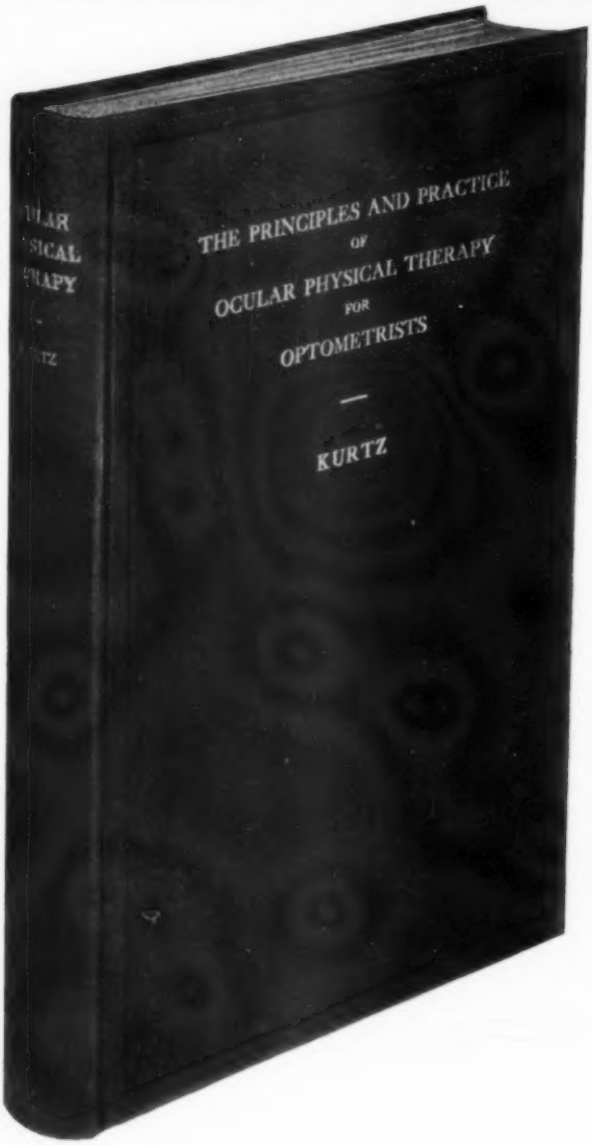
THE WALMAN OPTICAL COMPANY
229 MEDICAL ARTS BLDG.
MINNEAPOLIS, MINN.

FARGO GRAND FORKS ST. PAUL

Begin the New Year right,
dispense first quality merchandise,
the only kind we supply.

"Established 1913"

N. P. Benson Optical Co., Inc.
Main Office: MINNEAPOLIS, MINN.
ABERDEEN BISMARCK RAPID CITY STEVENS POINT
LA CROSSE WAUSAU DULUTH EAU CLAIRE



WHAT THE LEADERS SAY

You have done a fine piece of work in making this material readily available to optometrists. Congratulations.

Prof. of Physics,
University of Minnesota.

H. H. Wood, M. D., of our hospital read your book and is highly enthused over your efforts. This is a far better recommendation than anythink I might add.

Optometrist,
Marysville, Kansas.

It is a splendidly prepared piece of work.

Optometrist,
So. Royalton, Vt.

I consider this book the outstanding contribution to Optometry of the last twenty-five years.

Optometrist,
Fessenden, N. D.

This book is sent on approval to ethical optometrists.
(Size 6½x9½, 242 pages, 48 illustrations.)

APPROVAL BLANK—CLIP AND MAIL TODAY

American Journal of Optometry
1502-4 Foshay Tower, Minneapolis, Minn.

Kindly send me on approval a copy of "The Principles and Practices of Ocular Physical Therapy for Optometrists" by Dr. J. I. Kurtz. If after reading it I do not find anything of value to me I will return it in five days and you will refund me all I have paid for it.

☐ Send book postage prepaid. I enclose my check for $4.50.
☐ I will pay the postman $4.50, plus a few cents postage.

Name..... Street.....
(Print or write plainly)

City and State.....

The right is reserved to reject any order or orders for this volume.

AMERICAN JOURNAL OF OPTOMETRY

Vol. 14 JANUARY, 1937 No. 1

AN OPINION ON THE MEANING OF COLORED MIRAL REFLEXES AND ON MYOPIA*

James H. Drakeford, Opt.D., F.A.A.O.
New York City, N. Y.

I have read with interest your editorial[1] on Colored Miral Reflexes in the October edition of the AMERICAN JOURNAL OF OPTOMETRY, and I agree that this is a matter for research.

Since these reflexes cannot be illustrated by color, a description of my findings and conclusions will have to suffice.

About 20 years ago I first noticed a reddish reflex, in the left eye only, of a patient then being examined ophthalmometrically: the right showed a clear, or neutral reflex. This led me to make a more careful inspection, which revealed a case of incipient iritis in the left eye. This further lead me to make inquiry concerning the patient's health, which was none too good. She was a victim of chronic constipation, and a neurotic subject as well. It was my belief that the formation of toxemia from the sub-oxidation resulting from the impacted bowels, and the sluggish elimination was the fundamental cause of the eye disturbance. Treatment for the body ailments by her family physician confirmed my opinion in this case.

The above mentioned incident created within me a desire to know more about this phenomenon. My subsequent observations brought me to the conclusions quoted by Ryer, and which were presented before the Virginia Academy of Optometry shortly before Dr. Ryer's books on Ophthalmometry was written. Both he and I have searched literature for further information, but without result.

Those subsequent observations, as quoted by Ryer, are as follows: A healthy eye in a healthy person will give a clear and brilliant reflex, all outlines of mires being clear cut, regular and definite. These are found mostly in hypermetropes of low degrees, where the person is young and vigorous.

---

*Submitted for publication Nov. 22, 1936.

[1] Koch, Carel C. Colored Miral Reflexes. American Journal of Optometry. Vol. 13, No. 10, pp. 390-395. 1936.

An eye which carries more or less inflammation of the tissues will show a reddish halo or atmosphere and a subdued reflex. This reddish or pinkish reflex is usually found in myopes—particularly in that type where there is more than a minimum amount of myopia.

Eyes of neurotics or those suffering from high nerve tension or inflammation of the nerves, such as nervous prostration, will show a steel gray atmosphere and a very brilliant reflex.

Since Ryer's comment and quotation, I have added the following:

In kidney disorders the reflex is usually a yellowish tint of poor quality.

In neurotic, rheumatic, arthritic and other acid conditions the reflexes are always more grayish than normal.

I might add that a clear and normally neutral reflex in middle aged persons indicates to me an unusual amount of vitality and nervous reserve.

A dull and sluggish reflex, of neutral character, indicates a low vitality at any age of the patient.

In addition to color reflexes, I have used the ophthalmometer to locate particles of glass and other indistinct foreign bodies. It also shows any irregularity in curvature due to injury or pathology, incipient or ancient ulcers or other disturbances, and enables me to forestall the patient's information in many instances.

The forementioned characteristics are all the definite ones which I have discovered so far, but this does not mean that I have concluded the subject. I am constantly on the alert, and my hope is that others who may be interested in this phase of our work will help me by their own efforts, and the publication of their findings, as these findings are now a part of my regular examination.

In my opinion, it does not matter what make of ophthalmometer is used. When I first noticed this phenomenon I was using a Sutcliffe, but for the past 15 years I have used a General Optical Co. instrument. In any case, it requires a very well developed sense and power of discrimination of color tones to recognize the varying reflexes.

Since I have mentioned myopia and its reddish reflexes, I am constrained to make a few remarks concerning my opinion of myopia: In practically all true myopes we find a soft texture of tissues of the eyeball, as a whole, as well as enlarged pupils, but enlarged pupils are not confined to myopes. They are sometimes found in hypermetropes who are afflicted with some form of gastric disorder. The myopes' enlarged pupils, in my opinion, are due to a tired condition and a sluggishness of the ciliary muscle because of insufficient nerve stimuli. All real myopes are anaemic. This can be proven by the brilliant reflex from the ophthalmoscope and retinoscope. The pale retina indicates a lack of blood supply and lack of sufficient nutrition to the tissues. Anaemia deprives the entire body structure of proper nutrition. Improper nutrition in turn decreases

the nervous innervation and tonicity, hence all of the tissues of the body are soft and usually sluggish in function, including the entire eyeballs, and the constant pressure of the recti muscles against the eyeballs tend to elongate the spherical body, which creates myopia, because of the soft texture of the tissues of which it is formed.

Real myopia, in my opinion and observation, is not curable nor can it be stopped by lenses or otherwise, for the simple reason that anaemia is not permanently curable, and myopia being the result of anaemia what can we do about it, or with it—except to correct it increasingly from time to time as it progresses. To prove this I have taken children who develop myopia shortly after they have entered school, where real eye strain begins. They are always anaemic and I have watched those children gradually grow into more and more myopia as the years have passed.

Of course, there are pseudo-myopes who are really hypermetropic. These cases can be cured.

I am not unmindful that there are many eminent optometrists who do not agree with my opinion. All that I ask is that they make their own observations and watch the follow ups, until the period of growth is ended, and do it without prejudice in favor of any instrument or system of exercise.

No one is more ready to change opinions than I, but first I want to be shown a real reason for doing so.

DR. JAMES H. DRAKEFORD
SUITE 514. 110 WEST 34TH ST.
NEW YORK CITY, N. Y.

FURTHER STUDIES OF THE FUSIONAL CONVERGENCE AMPLITUDE*

Part III.

William J. Tait, B.S., M.A., F.A.A.O.
Philadelphia, Pa.

Practitioners interested in orthoptics are, for the most part, in general agreement as to the efficacy of fusional convergence training in selected cases. Especially is this true of patients manifesting inefficient ocular neuro-muscular mechanisms, with the accompanying signs and symptoms germane to this abnormality. Orthoptic methods have afforded symptomatic relief to a vast number of these cases, despite a quite frequent lack of knowledge concerning the causal antecedents. Marked procedural variations have also produced in many subjects, gratifying results not in accordance with accepted hypotheses.

The present study is an outcome of the realization that the differentia of functional inefficient ocular muscle symptoms from those operating at an efficient level, is at times, exceedingly difficult. Although the literature is replete with studies and clinical reports dealing with inadequate neuro-muscular functions, no reliable data was available as to the effect of ocular collisthenics in individuals possessing comfortable single binocular vision. Accordingly, as a reference point, it was proposed to evaluate experimentally, the possibilities of systematic ocular muscle training in subjects grouped under this classification.

At the last two Academy meetings, papers[1, 2] were presented summarizing the results of an experimental investigation of the positive and negative fusional convergence amplitudes. In this preliminary study, 13 subjects were employed, 6 subjects receiving base-in and 2 subjects receiving base-out exercises on a Genophthalmic kratometer. The remaining 5 subjects were subjected to a simple versional type of exercise with the aid of a Cameron myoculator. An analysis of the data revealed a significant increase in the adductional power of each subject, regardless of the instrument used and the type of training employed.

The present paper is a continuation of the previous investigation with certain modifications in technique, together with the employment

*An abridgement of the material presented before the American Academy of Optometry at New York, August 26, 1935.

of somewhat different instrumentation. Being cognizant of the fact that only a few subjects had been used in the earlier experiments, it was decided to further amplify this work in an attempt to clarify the somewhat perplexing and intriguing subject of innervational modification as it applies to the extra-ocular muscles.

The program of work involved in the present inquiry can be conveniently divided into three parts: 1. The effect of stereoscopic base-in exercises employing the Stereo-Orthoptor.; 2. A continuation of versional training using the same technique described in a previous report; 3. A statistical correlation of blur-point data with the accommodative-convergence reflex.

Procedure (General):

The research project was conducted in the clinics of the Pennsylvania State College of Optometry. Eight male students were selected from the senior class on a basis of meritorious work and interest in scientific problems. The subjects ranged in age from 20 to 26 years, the median age being 22. Complete data of the refractive condition of each subject was obtained and ocular corrections prescribed where needed. Comfortable single binocular vision and freedom from accommodative or convergent anomalies were prerequisite. Any evidence of physical or mental disturbances constituted sufficient grounds for rejection. The technique and procedure were carefully explained and preceding the actual experiment each subject was drilled in measuring his own ductions and phorias. Several advantages accrue as the result of this method: (1) Greater accuracy and precision is possible, (2) A second source of reaction-time error is eliminated, (3) and at a subsequent date the permanency of any changes produced by the exercises may be determined.

In obtaining reliable data, it is imperative that a standardization of method be employed, otherwise a comparison of results is meaningless and futile. A previous report emphasized the necessity of controlling the intensity of illumination before each eye when ascertaining the neuro-muscular status. Of equal importance is the development of a technique which will permit the rotary prisms to be turned at a predetermined uniform rate. This is a frequent source of error when measuring ductional powers and will appreciably affect the results unless kept constant.

The lateral ductions were ascertained with distant fixation upon a Snellen 20/200 letter "E." Rotary prisms forming a part of the De Zeng phorometer, were turned simultaneously before the eyes, bases-in for abduction and bases-out for adduction, until diplopia ensued. The rate of turning was approximately 80 prism-diopters per minute. Reversion to fusion was carefully noted. Fixation for near was at 1/3 M. upon a small, 4 mm. letter "E" printed on a white card. The intensity of illumination before each eye was maintained at a prearranged value of 22 foot-candles and was checked frequently with a Weston "Sight-Meter."

In measuring the phorias, the same fixation-object was employed at the respective distant and near points. In addition, fusion was prevented with a dissociating prism of 6 prism-diopters placed base-down before the O.D. The amount of prismatic power, base-in or base-out, necessary to cause a vertical alignment of the two "Es" indicated the degree of exophoria or esophoria. At near, sufficient time was allowed for the vacillating test-object to attain equilibrium.

With a knowledge of the inter-pupillary distance, and the existing phorias at the two points of fixation, it is a relatively simple mathematical operation to calculate the amount of physiological exophoria and accommodative-convergence under these conditions.

The subjects were required to submit written introspective reports during the period of exercising. It is presumed that these reports were sufficiently valid, as the subjects had received considerable psychological sophistication, as a part of their professional training.

Before continuing with a more detailed description of the procedure, I wish to acknowledge my indebtedness to J. W. Bracken, B H. Hammaker, R. L. Henry, G. H. Leavitt, W. F. Saars, H. Z. Schmidt, F. H. Witzke, and N. Zevin, for their kind and cooperative assistance in the prosecution of this research.

Procedure (Specific):

1. Four subjects received base-in treatment on the Stereo-Orthoptor for a period of approximately two months. The fixation-targets consisted of two concentric circles (cone frustrum) placed to occupy the first notch away from the subject. This permitted a stereoscopic impression with the smaller end of the two cones appearing more distant. The swing of the mirrors was set to correspond with the mirror angle, thus, assuring a visibility of the targets throughout the entire swing of the mirrors. The indicator was placed at the white figure No. 1. The mechanical arrangement of the moving parts, causes the mirrors to automatically open and close 18 P.D. every 23 complete swings. This feature allows both ductional and versional exercises to be given. Six treatments of 15 minutes each, constituted a daily exercise. Training exercises were given on alternate days of the week (Saturday and Sunday excluded). Each subject, therefore, received approximately 135, 15-minute periods of exercise. A control period of a week before and after treatment yielded average values capable of comparison. Both ductions and phorias were recorded twice daily, before and after each battery of treatments.

B. Concurrently, four other subjects were submitted to a simple type of versional exercise, which consisted in directing the eyes to a revolving luminous target, projected on a white screen from the tube of a Cameron myoculator. The projected target was an inch in diameter, rotated clockwise 36 times per minute, and described a circle of approximately a meter in diameter. As in part A, six treatments of 15 minutes

duration each, were given on alternate days for a period of two months. During this time the subjects wore their ocular corrections, if indicated, and the fixation of the stimulus-object was with both eyes. The neuromuscular status was noted as above.

C. As a supplement to these procedures, the accommodative-convergence and adduction blur-points of 56 subjects from the senior class at the college were obtained. About 4 years ago E. F. Tait intimated the possibility of a functional relation between these two reflexes. He has maintained that an early blur is indicative of a rather close association between the accommodation and convergence, while conversely, a late blur would suggest a loose connection between these two functions, and give a relatively low accommodative-convergence. The blur-point during the adduction test was obtained by having the subject fixate a Maxwell near-point card at 1/3 M. Essentially, this card is a reduced photographic reproduction of a Snellen test card. The 20/20 line is calculated to subtend an angle of 5 minutes at this distance (about ½ mm. in height). Prisms, base-out are introduced until the smallest readable letters are no longer legible. The difference between the blur and break points, expressed as a percentage of the break, was correlated with the convergent-accommodation, determined indirectly from a knowledge of the accommodative-convergence. The Rank-Difference Method of Correlaton was used in deriving a coefficient.

Data:

Base-In Exercises (Stereo-Orthoptor)

Subject: F. H. Witzke

	Distance			Near		
	Abd.	Add.	Phoria	Abd.	Add.	Phoria
First control week	8/5	40/6	2 eso	25/14	32/20	2 exo
Final control week	7/4	57/12	3 eso	16/8	44/29	2 eso

Inter-pupillary distance 64 mm.
Accommodative-Convergence: 15 P.D. (before) 18 P.D. (after).

Subject: N. Zevin

First control week	10/6	15/4	5 exo	22/18	22/17	14 exo
Final control week	9/6	39/14	3 exo	23/13	36/21	12 exo

Inter-pupillary distance 60 mm.
Accommodative-Convergence: 9 P.D. (before) 9 P.D. (after).

Subject: G. H. Leavitt

First control week	12/6	60÷	2 exo	26/14	41/26	11 exo
Final control week	16/10	60÷	4 exo	33/22	51/39	5 exo

Inter-pupillary distance 63 mm.
Accommodative-Convergence: 10 P.D. (before) 18 P.D. (after).

Subject: J. W. Bracken

First control week	7/1	36/8	6 eso	23/11	32/13	ortho
Final control week	10/4	53/9	5 eso	23/9	40/14	2 eso

Inter-pupillary distance 64 mm.
Accommodative-Convergence: 13 P.D. (before) 16 P.D. (after).

Versional Exercises (Myoculator)

Subject: H. Z. Schmidt

	Distance			Near		
	Abd.	Add.	Phoria	Abd.	Add.	Phoria
First control week	5/3	11/8	ortho	17/12	15/13	7 exo
Final control week	5/4	12/10	ortho	22/17	21/20	7 exo

Inter-pupillary distance 61 mm.
Accommodative-Convergence: 11 P.D. (before) 11 P.D. (after).

Subject: B. H. Hammaker

First control week	9/7	10/2	4 exo	27/24	9/4	20 exo
Final control week	9/7	9/6	3 exo	27/25	8/6	16 exo

Inter-pupillary distance 61 mm.
Accommodative-Convergence: 2 P.D. (before) 5 P.D. (after).

Subject: W. F. Saars

First control week	9/6	17/3	3 exo	28/13	18/5	12 exo
Final control week	10/7	24/6	3 exo	21/9	33/22	8 exo

Inter-pupillary distance 66 mm.
Accommodative-Convergence: 11 P.D. (before) 15 P.D. (after).

Subject: R. L. Henry

First control week	10/6	28/7	1 exo	29/20	29/21	10 exo
Final control week	13/6	55/22	1 exo	33/19	43/23	9 exo

Inter-pupillary distance 63 mm.
Accommodative-Convergence: 10 P.D. (before) 11 P.D. (after).

Discussion of Results:

An analysis of the data reveals some interesting facts, representative of the technique and procedure adopted. Base-in training with the Stereo-Orthoptor had practically no effect on the abduction for distance in two subjects. The other two subjects showed an increase of 3 and 4 P.D. At near, the abduction remained substantially unchanged in two subjects, while one subject had an actual decrease of 9 P.D. and the other subject an increase of 7 P.D. A striking feature is noticeable in the improvement of the adductions of the 4 subjects, ranging from a minimum of 17 to a maximum of 24 P.D. at distance, and from 8 to 14 P.D. at near. The accommodative-convergence responded to the extent of an increase of 3 to 8 P.D. in 3 subjects, and with no variation in the the remaining subject.

Versional exercises employing the myoculator had an effect similar to the prism calisthenics. No material change was observed in the abductions for distance. At near two subjects indicated slightly higher abductions amounting to 3 and 4 P.D.; one case showed no change, while an actual decrease of 7 P.D. resulted in the remaining subject. An appreciable gain in the adductions, for distance and near, was obtained in 3 subjects, and one subject had no significant change at either point of fixation. The accommodative-convergence relationship was somewhat higher in 3 subjects as the result of vergence stimulation.

It is plainly evident that the positive fusional convergence amplitude is capable of being developed. The increase in the adduction threshold can be attributed to the operation of the fusional convergence as the result of the retinal images stimulating the peri-macular fusion areas. The neural impulses are conveyed to the motor nuclei, after modifying the tonic reciprocal innervation at the association level, in the interest of single binocular vision. It seems logical that the adduction should be more responsive to training inasmuch as it is the one function more frequently required under normal conditions. Fusional convergence development is primarily a learning process, and as such it obeys the secondary laws of association, which utilize the factors of primacy, recency, repetition, vividness, and emotional congruity. Neuro-physiologists agree that the efficiency of neural pathways is dependent upon the frequency of their use. By repeatedly deflecting the foval images out into the peri-macular regions, a subliminal learning process is set in operation. The outcome of this operation may either increase the strength of the associative bonds causing a higher efficiency of the peri-macular cones, or it may increase the number of functional cones, or both.

At present there is a divergency of viewpoint as to the exact nature of the learning process. Kappers[3] has suggested that neuro-biotactic changes occur at the synapse, causing dendrite and axone to proximate under the influence of bio-electric currents. Verworn[3] has argued that an increase in size of the neural cell intensifies the nerve impulses. Sherrington[3] has contributed a "neurone-synaptic" theory which assumes that the permeability of the cell wall increases, thus affording a gradual lessening of the synaptical resistance. Every conceivable change possible has been offered, including the theories of molecular orientation due to electronic bombardment and oscillation of ionized molecules, to explain the neural basis of learning. These diverse theoretical implications, although of academic interest, do not alter the fact that the functional pathways are and can be developed.

Of the several reflexes operating at the near-pont under proper stimulus-conditions, it appears that the fusional convergence is directly responsible for any modifications that occur in the adductions. Presumably, the accommodative-convergence has little effect in this type of situation. A recent contribution by E. F. Tait[4] suggests that this reflex is not normally functioning. It is effective only when the accommodation is made the dominant stimulus and the convergence the response.

In an analysis of the blur-point phenomena, the Rank-Difference Formula was used to correlate the blur-point percentage with the convergent-accommodation. A coefficient of correlation of —0.92±.013 was found. This signifies that as the blur-point approaches the break threshold, there is a corresponding decrease in the convergent-accommodation. This is an extremely high coefficient for a psycho-physiological function, and may be attributed to certain limitations inherent in the Rank-Difference Method, and secondly, to the indirect method of measuring the

convergent-accommodation. The Rank-Difference Formula was applied merely as a preliminary survey to determine the possible existence of a relationship, in a limited number of subjects. The convergent- accommodation was determined indirectly from the accommodative-convergence. E. F. Tait[5], in a statistical study of 500 cases obtained evidence indicating that the accommodative-convergence and the convergence-accommodation, are proportional in amount and reciprocal in nature. A coefficient of correlation, using the Pearson Product-Moment Method, was derived and found to be $+0.73 \div .014$. As this is not a perfect positive coefficient, a source of error is introduced in deducing convergent-accommodation values from a measurement of the accommodation-convergence. It is proposed, in future studies, to measure the convergent-accommodation by more objective methds. This would entail the use of Dynamic Skiametry and the ascertainment of the subjective refraction. The difference between the gross dynamic skiametric findings and the subjective lens acceptance, will, when subtracted from 3 diopters, the accommodation necessary for 1/3 M., give a remainder which is the convergent-accommodation.

We are justified in concluding, however, that in this particular group of 56 subjects, there is some evidence of a relationship between the blur-point percentage and the convergent-accommodation. It can be demonstrated that the remaining blur with base-out prisms is due to the accommodation and not the convergence by adding minus lens, which immediately remove the indistinctness of the test-object. In those subjects who had a comparatively large amount of accommodative-convergence, the blur area was relatively small. Conversely, a smaller amount of accommodative-convergence, indicative of a less efficient reflex arc association, was usually accompanied by a larger blur-point value.

Despite the application of a careful technique, quantitative measures of the reversion to fusion were so variable in amount, that they were apparently meaningless. These inconsistencies can be attributed to many factors, such as fatigue, state of health, and attentional and motivational attitudes.

From the written introspective analyses and personal interviews of the subjects participating in this experiment, several significant facts were noted. During the first week of the exercises, several of the subjects developed severe frontal and occipital headaches. Two subjects in particular, had slight spells of dizziness and nausea. However, as the experiment proceeded, these symptoms disappeared and were replaced by a feeling of greater freedom in ocular movements. No permanent relief-effects were reported by any of the subjects. The subjects also mentioned that their perception of the tri-dimensional cone was not a very satisfactory stimulus for the maintenance of attention. The solution to this problem may lie in the field of stereoscopic moving pictures.

Summary:

As this report is a preliminary study, considerably more research in this field is necessary before any attempt to formulate a working hypothesis will be possible. This study is not as yet complete and we can only tentatively evaluate the derived data. The following conclusions appear warranted by the results of this experiment:

1. That experimental evidence is offered, in a limited number of cases, to show that it is possible to develop the fusional amplitude, in a positive direction, with either stereoscopic base-in exercises, or by simply rotating the eyes in a clock-wise direction over a circular pattern.

2. That in an experimental situation, employing the technique and procedure described, the traditional philosophy of base-in therapy is not supported.

3. That a high coefficient of correlation has been found between the blur-point and the convergent-accommodation. Because of an inadequate number of cases, this coefficient should be accepted tentatively and interpreetd with caution.

4. That quantitatively, measures of the reversion to fusion, lack definite diagnostic value.

5. It is suggested that some form of stereoscopic moving pictures be employed as a more efficient and economical means in ocular neuromuscular training.

DR. WILLIAM J. TAIT
1824 W. GIRARD AVE.
PHILADELPHIA, PA.

BIBLIOGRAPHY

1. Tait, William J., An Experimental Investigation of the Negative Fusional Convergence Amplitude. American Academy of Optometry Year Book—1933, 8: 155-167.

2. Tait, William J., Further Studies of the Fusional Convergence Amplitude, Part II. American Academy Year Book—1934.

3. Lashley, K. S., Nervous Mechanisms in Learning—Foundations of Experimental Psychology, Clark University Press. 1929, Chapter 14.

4. Tait, Edwin Forbes, A Report of the Results of the Experimental Variation of the Stimulus Conditions in the Responses of the Accommodation Convergence Reflex. American Journal of Optometry, 1933, 10:428-435.

5. Tait, Edwin Forbes, A Reciprocal Reflex System in the Accommodation-Convergence Relationships. American Journal Psychology, 1933, Vol. XLV, pp. 647-662.

COLOR, MOTION AND FORM PERCEPTION FIELDS*

A. R. Reinke, Opt.D., D.O.S., F.A.A.O.
1624 Franklin St., Oakland, California

In my humble way I will tell the story of a man in need of help, and I am sure that there are many more like him.

Brombach and I have gotten together on many, many occasions to discuss the subject of Color, Motion and Form Fields. We made surveys together, tabulated the findings, analyzed the findings and many other factors to prove first to ourselves that it was 100%. Dr. Brombach has worked day and night for weeks, months and years to perfect something very close to his heart, and the results in book form can now be obtained.

I could write much concerning surveys conducted in schools and factories, but statistics gathered over the past four years in the Field of Sports, which I have in my files, is evidence to me of the importance of proper eye examinations in this type of endeavor. That which is true of athletes, is also true of school children, factory workers and automobile drivers.

Some eighteen months ago I visited with a certain specialized group. I mention the months to prove a statement to be made later on. At this meeting were men representing corporations owning large fleets of cars, along with representatives of the local safety council. After a discourse on Color, Motion and Form Perception Fields, there arose all types of questions concerning accidents.

One of the men present told an interesting story of an employee, Mr. B., that caused definite interest. Mr. B. was later given a complete eye examination. Without going into the case history except to say he had had many automobile accidents, the company thought it might be his eyes so they had him get a pair of glasses. I do not know the type of examination that was given him at this time, but needless to say, the glasses were of no value in the reduction of automobile accidents. After a complete examination in our office the glasses were taken from him. Following are the findings, using the Graduate Clinic Foundation examination procedure.

---

*An abridgment of the material presented before the American Academy of Optometry at Chicago, Ill., August 23, 1936.

Mr. B.
Age 42.
Occupation—Truck driver.
History—No complaint—His company wanted his eyes examined again because of too many accidents.
Old Rx. + 0.75 = + 0.50 x 90 O.U. Vision 20/20.
Naked vision—O.D. 20/20, O.S. 20/20, 20/20 O.U.
External examination—Negative.

1. Ophthalmoscope—Negative.
2. Ophthalmometer—OD 41.75 x 180 42.00 x 90
   OS 41.75 x 180 42.00 x 90
3. Habitual phoria
   Dist. 2 Eso
   13A Near O
   P.D. 63 mm.
4. Static Ret. OD +1.00 D. Sph.
   OS +1.00 D. Sph.
5. Dynamic Ret. OD +3.00 D. Sph.
   20 inch OS +3.00 D. Sph.
6. Dynamic Ret. OD +2.25 D. Sph.
   40 inch OS +2.25 D. Sph.
7. Subjective OD + .75 D. Sph.
   OS + .75 D. Sph.
8. Induced Phoria—1 Eso.
9. True Adduction—5.
10. Convergence—15/3.
11. Abduction—5/3.
12. Vertical Phorias—Neg. Ductions Neg.

13B. Induced Phoria—New Rx. 1 Exo.

14A. Cross Cyl. OD +2.50 D Sph.
   Dissociation OS +2.50 D Sph.

15A. Induced Phoria—10 Exo.

14B. Cross Cyl. OD +2.00 D Sph.
   Binocular OS +2.00 D Sph.

15B. Induced Phoria—7 Exo.

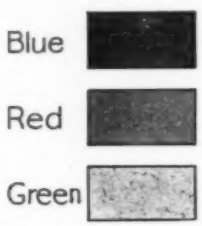
16A. Tol. Add. Stim—X.
16B. Pos. Fus. Res.—16/8.
17A. Tol. Add. Inhib.—16.
17B. Neg. Fus. Res—20/16.
18. Vertical and Ductions—Neg.
19. Amp. Acc. O.U.—3.
20. Tol. of Acc. Stim— —1.00.
21. Tol. of Acc. Inhib. +2.00.

Studying the examination, as made above, one is inclined to say that this man needs lenses to relieve certain conditions and he should also have orthoptic training. But when one compares that Rx that might be given with the one given before, it is reasonable to assume that help of

this type would be of little benefit. So it was on this assumption that I did not prescribe lenses or treatments without further investigation.

The thought foremost in my mind was that this man was having too many accidents at intersections and that he would be asked to resign or keep his job according to my recommendation.

From the above examination it is also plainly visible that his direct vision is normal, with or without the aid of lenses. This we know cannot be the cause of accidents *at intersections.*



Color Key to Graphs

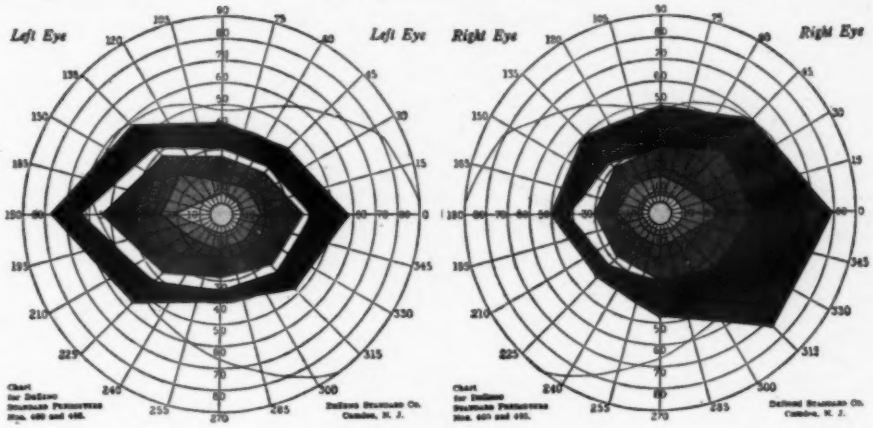
After the Refractive Examination has been completed in our office we then take Color Fields along with Motion and Form Perception Fields. This type of examination is made with every patient as the refractive examination *is not* always indicative of the difficulties. Also this type of examination is made at various times of the day, usually early in the morning and late afternoon.

Mr. B's Color Fields, Motion and Form Perception Fields were taken at 9:15 A.M. as shown by charts Nos. 1 and 2. Relative size of the fields are restricted. After making a careful study of the charts, I feel that we are dealing with some type of infection. The black areas on Charts Nos. 1 and 2, and all other charts to follow, are Motion and Form Perception Fields. The outside edge of the black is Mr. B's recognition of Motion, while the inside edge is recognition of Form. It is easily seen that Form perception is very low for the two eyes with the right eye the poorer of the two, and this is especially true in the horizontal planes. In automobile driving the examiner should be especially interested in the Indirect Fields as pertains to the Horizontal Planes because the ability to drive safely depends on the quality of recognition in the Horizontal planes while fixing straight ahead.

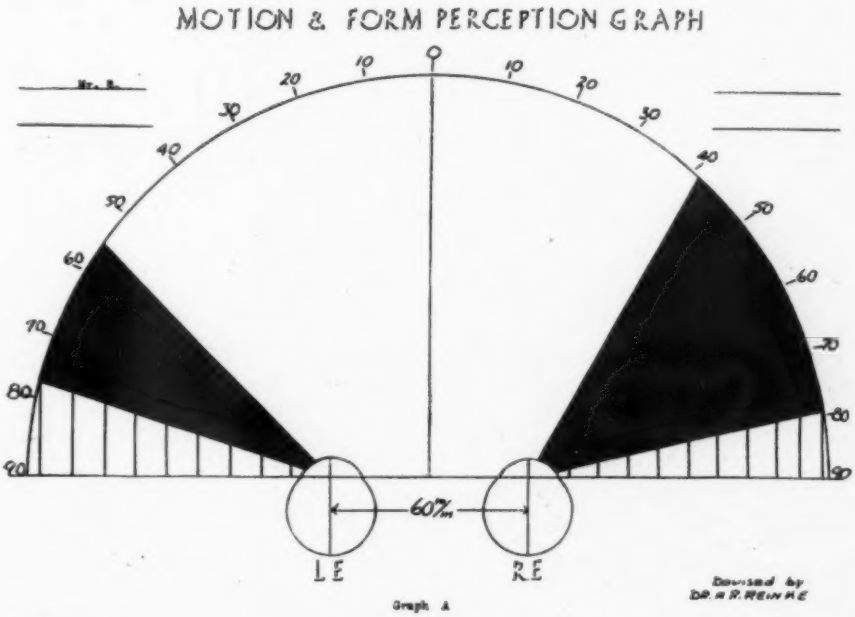
For the purpose of clarity and the ability of the patient to comprehend your actions, let us transfer the Horizontal Planes of Motion and Form Perception from Charts Nos. 1 and 2 to Graph A.

All of the serious accidents in which Mr. B was involved, were from the right side, and this is quite obvious when we study Graph A.

Mr. B. 9:20 A. M. Chart No. 1 Mr. B. 9:15 A. M. Chart No. 2



Reinke



With recognition of Motion at 80° and recognition of Form at 41°, it is plainly visible that an object moving in towards the Direct Field from the right side will not be recognized immediately as an object of danger. Then too we must take into consideration that Recognition of Motion

was not perceived until the object reached the 80° plane. This was due to the protruding bony structure of the orbit. So the actual difference between Recognition of Motion and Recognition of Form is not 80° to 41° but 90° to 41° or a total of 49°.

Motion and Form Perception for moving objects can be instantaneous. I believe when the difference becomes greater than 15° to 25° we are dealing with an Accident Prone Driver.

Mr. B is not blind in that area, but I do contend, from the hundreds of patients examined, that the impression of moving objects in that particular field is quite obscure in respect to the higher visual brain centers. And so as objects move in closer and closer towards the Direct Field of Vision without noticeably affecting the higher visual centers, only super human effort will avoid an accident when the moving object is suddenly recognized as an object of danger.

The Left Eye has not been discussed as the problem involved concerned the Right Eye only. In passing it might be said, however, that Motion and Form Perception for the Left Eye also is below the average 15° to 25° difference. Here again the total difference is 35° (90°—55°= 35°). Fortunately or unfortunately, depending on the viewpoint, Mr. B has never had an accident from the left side.

Charts Nos. 3 and 4 and Graph B are the fields taken in the late afternoon. Very little difference is noticed between the Fields taken in the morning and the afternoon, which again proves conclusively in cases of infection that little difference is noticed, while in most cases of intoxication we might find normal fields in the morning with abnormal fields later in the day.

After a thorough questioning of health factors, Mr. B was sent for a full mouth X-ray.

A day later the following letter arrived:

Dear Doctor:

Enclosed find Mr. B's X-rays. We find that five teeth, marked on the X-ray, should be removed. Thanking you for referring Mr. B to us, I am, Sincerely,

Dr. F.

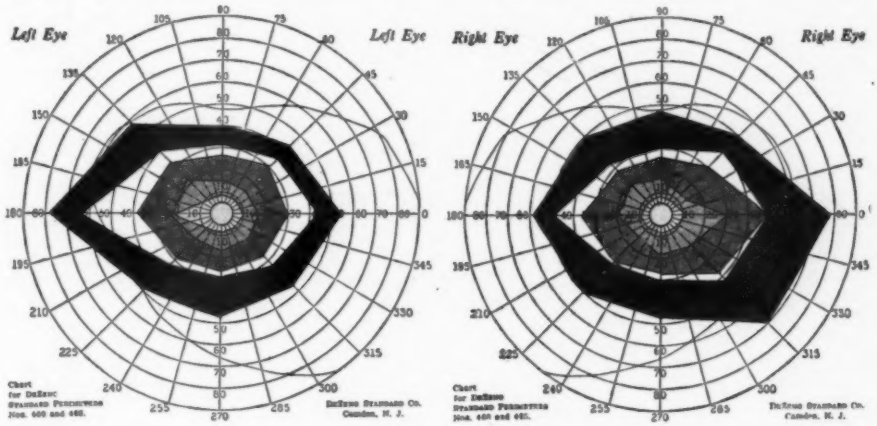
The teeth were removed by Mr. B's dentist within a few days. Forty-eight hours after the extraction the fields as shown on Charts Nos. 5 and 6 were taken. Graph C again clarifies the situation in respect to the horizontal plane. Fields were again taken after forty-eight hours more had elapsed and they were absolutely normal as shown in Charts Nos. 7 and 8 and Graph D.

Let us assume that I had stopped making further investigations after the Refractive Examination had been completed. I could have given Mr. B new lenses and orthoptic training, and still be within the realm of professional Optometry. It is done every day. But as professional optometrists we must look further than the mere fitting of a pair of glasses and then trusting that the patient's difficulties will disappear.

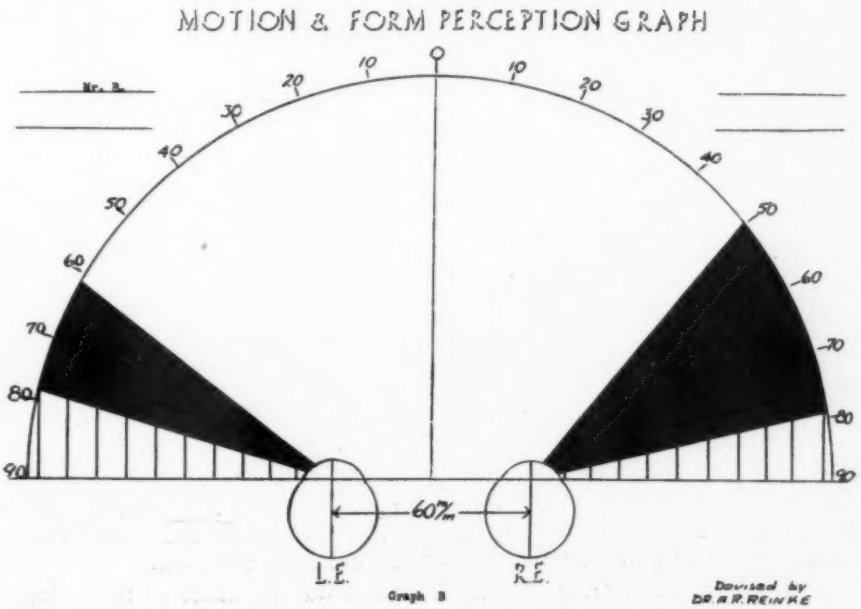
To have given Mr. B new lenses and training would simply have meant defeat, because it is impossible to get lasting results with training when a definite infection exists.

Determine with Color, Motion and Form Perception Fields whether an infection is indicated. If infection is present then your professional

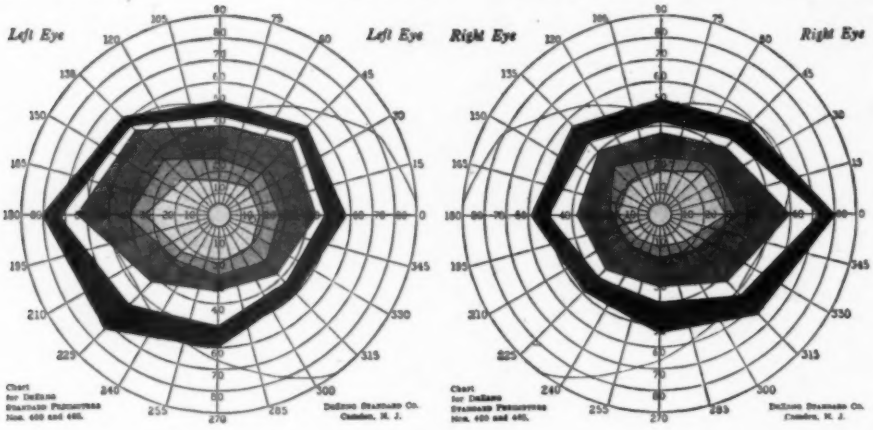
Mr. B. 4:35 P. M. Chart No. 4 Mr. B. 4:30 P. M. Chart No. 3



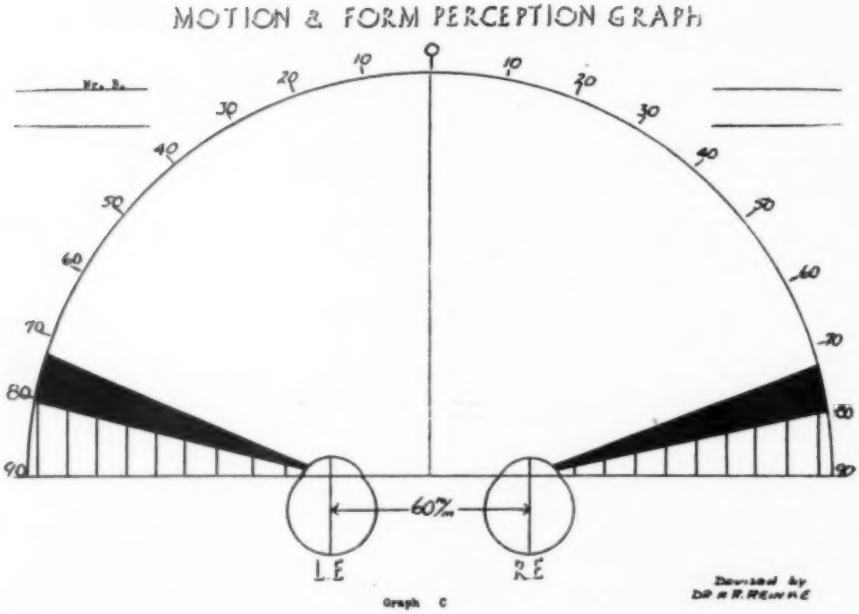
Reinke



Mr. B. 5:05 P. M. Chart No. 6 Mr. B. 5:00 P. M. Chart No. 5



Reinke



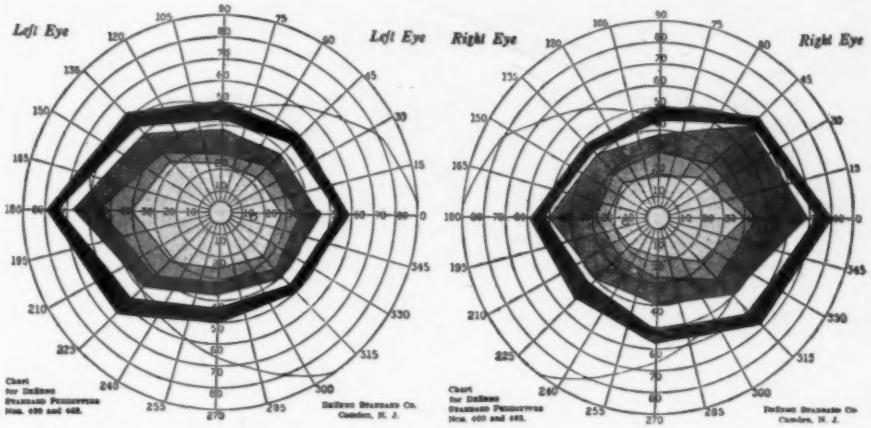
Graph C

judgment should determine the need for lenses immediately or after other professional advice has been obtained. But as to Orthoptic training, it should never be given until the infection has been removed.

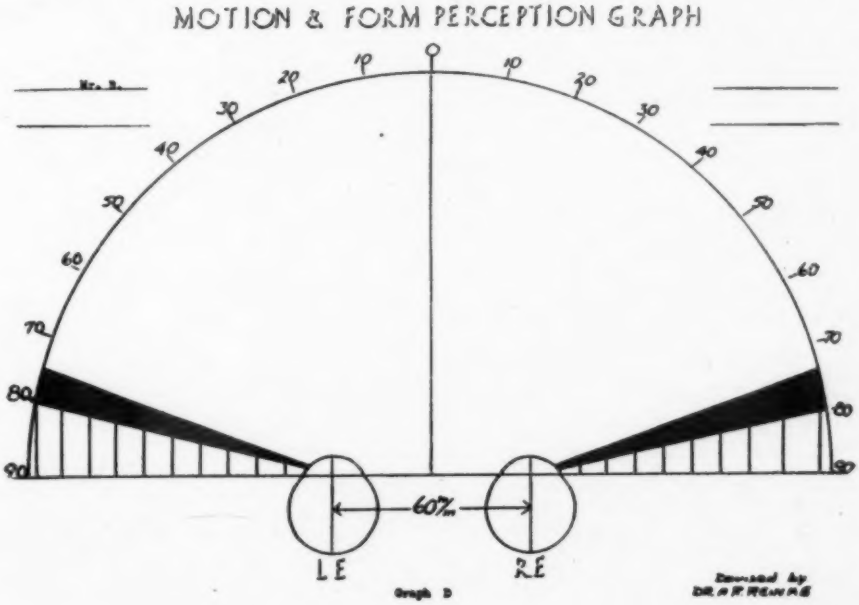
In the case of Mr. B, Dental Infection was the cause of the collapse

of all the fields and especially the green fields. The removal of this abnormal health condition, as indicated in the Normal Fields shown in Charts Nos. 7 and 8, paved the way for six orthoptic training periods

Mr. B. 5:05 P. M. Chart No. 8 Mr. B. 5:00 P. M. Chart No. 7



Reinke



given to Mr. B. During these periods special attention was given to Stereopsis and Positive Fusional Reserve.

Mr. B is a truck driver for a large trucking corporation. Since the examination he has driven steadily for eighteen months without an accident and without the aid of lenses. During the preparation of this paper the writer has been informed that Mr. B has again been involved in a traffic accident. It may be other teeth or some other abnormal health condition. This is why periodical examinations should be demanded of all drivers. Health factors are very changeable and the eyes are barometers of these conditions.

In conclusion let me say that the Optometrists are the rightful professional group to make this type of examination.

Business conditions are improving. The trend is to give more attention to the individuals who might be concerned in traffic accidents whether on the open highway or in the city. The great and small will be seeking the man that knows. Insurance companies will demand it. State and national laws will eventually compel this type of examination.

But are we ready?

Remember it is not sufficient that the driver of a moving vehicle have 100% vision, but he must also have 100% perception for moving objects on either side while fixing straight ahead.

Refractive and muscular abnormalities should be taken care of where necessary.

Other conditions, such as color deficiency, stereopsis, time reaction, time reaction due to focal infection, time reaction due to alcohol, have been omitted purposely. There is much to be said concerning the last two conditions. Day by day we are finding information that shall prove valuable in controlling the important problem of alcohol.

DR. A. R. REINKE
1624 FRANKLIN ST.
OAKLAND, CALIFORNIA

DIFFERENTIALS IN HETEROTROPIA*

R. M. Hall, A.B., B.Sc.
Cleveland, Ohio

Regardless of the attention being focused upon it at the present time, the problem of squint is not new. In spite of the advances made in both medical and non-medical fields, the answer has not been found. The fact that the problem exists today, on nearly its original status, should be the more reason for modern students recognizing it as a problem in research. It becomes apparent, upon reviewing the literature, that there is still considerable controversy as to the possibilities of orthoptic training as a corrective measure. It also becomes apparent that the basis for part of this controversy lies in the fact, that, in the great majority, workers in this field are not sufficiently grounded in the differential characteristics of those cases which are amenable to treatment, surgical as well as orthoptic.

It is with the desire to reduce some of this existant confusion and to develop a sounder basis for differentiation that this paper is submitted.

Upon reviewing some of the major contributing causes of squint such as:

1. Pathology (local and general).
2. Morbid muscle changes.
3. Neuromuscular insufficiency or excess.
4. Ametropia.
5. Amblyopia.
6. Fusional insufficiency or loss.
7. Neurological deficiencies.
8. Psychological mal-adjustments.

It can readily be seen that no one method or procedure can possibly be a specific for the elimination of all types of strabismus.

However a generalized classification can be made as follows:

1. Those patients in need of general physical examination and care.
2. Those patients who are in need of surgical interference.
3. Those who are in need of surgical interference and post-operative orthoptics.

---

*An abridgment of the material presented before the American Academy of Optometry at Chicago, Ill., Aug. 25, 1936.

4. Those in need of immediate orthoptic training.
5. Those in need of psychoanalytical treatment.

In the first class, those patients in need of general physical examination and care, belonging to the following:

1. Cases of *paralytic squint* of recent origin. Due to latent luetic conditions, non-specific lesions or brain tumors. These patients are usually within the age limits of 35 to 60.
2. Cases exhibiting symptoms of constitutional disease, e.g., rickets, chronic rheumatoid conditions, etc. Ages from 2 to 25.
3. Cases showing a high and rapidly varying ametropia, in which a toxemia or focal infection is suspected.

In the second group, those in need of surgical interference, belong the following:

1. Those patients with a high lateral deviation 35 to 40 degrees.
2. Those cases of high lateral deviation (35 to 40 degrees) which are complicated by a high vertical deviation (10 degrees or greater).
3. Cases of high undiminishing vertical deviation. (10 degrees or greater).
4. Cases of true (essential) alternating squint.
5. Cases of the *Neuropathic Divergent* type which are of long standing and associated with Amblyopia or show *absolute convergence deficiency*.
6. Those cases where V.A. is less than 3% A.M.A. and has not been improved with lenses or amblyopic treatment.
7. Those cases in which there is *manifest fundus pathology*.
8. Those patients mentally lethargic or of low intelligence, imbeciles, etc.
9. Patients who are employed over long irregular hours and those who admittedly cannot afford the time necessary for training.

To the third class, those who need surgical interference followed by orthoptic treatment, belong the following:

1. Cases of 25 to 35 degree deviation in which motility (checked by version tests) is so poor, as to preclude success by any non-operative procedure. If there is any doubt here, the examiner has but to subject the patient to prolonged periods of rotational exercises, using adverse prisms.
2. Those cases associated with true horizontal or rotatory nystagmus.

There are two other types which really belong in this group. Those which have a *False Macula* or a *Faulty Projection*.

In the fourth class, those in need of immediate orthoptic treatment, are:

1. Those with deviations up to 35 degrees which are occasional, alternating or constant, lying within the age limit of 5 to 30 and the cause of which can be definitely attributed to neuromuscular excess or deficiency or to an ametropia.
2. Cases of slight deviation associated with Amblyopia-Ex-Anopsia.
3. Cases in which the development of the fusional faculty has been retarded.
4. Post-paralytic patients in which there is poor motility.
5. Divergent cases which show definite *positive convergence ability.*
6. Cases of suppression, even of long standing, in which diplopia can be readily induced.

Note: Many of the squints which are reported to have been eliminated in two or three treatments, are due to the fact that neutralization has not been strong and merely pointing out to the patient the presence of the two images and showing him how they are resolved, is sufficient to effect a cure.

Returning to the classification, it will be seen that the *paralytic squints* have been included in that group for general medical treatment and the *post-paralytics* in the class which may be treated with orthoptics. This brings up a finer point of differentiation: that of accurately measuring and recording the primary and secondary deviations, for it is only when a decrease is noted in the secondary deviation that the post-paralytics are included in the class amenable to orthoptic treatment.

As to what cases should be included in the 5th group, those in need of psychonanalytical treatment, there is still much doubt. That squints of this type exist, there can be little question, but sufficient knowledge to accurately differentiate them has been lacking. Various writers have reported prolonged cases of squint (existing even after surgical measures have been used) which have eventually disappeared after psychoanalytical treatment. In this group should be included:

1. Those cases associated with intermittent hysteria.
2. Many of the Neuropathic Divergent Squints.
3. Those squints which are periodical or occurring at regular intervals.

These classifications may be simplified to meet the practitioner's own requirements. Cantonnet admits only two classes, namely:

1. Those which can be re-educated.
2. Those which cannot be re-educated.

claiming 70% of all squints lie in the first class and 30% in the second, nevertheless, it will be found on inspection of the work of both Remy and Cantonnet that they have broken down these two primary classifications into smaller groups.

There may be a question as to the importance and meaning of these classifications, and it must be admitted they are seemingly long and

awkward. However, it will be found that their use over a period of months will make for an easier routine and will in the end save much of the time now being used on cases which are beyond help of the orthoptist.

DR. R. M. HALL
SMYTHE BLDG.
CLEVELAND, OHIO

BIBLIOGRAPHY

Cantonnet & Filliozat, "Strabismus," 1934.

Feinbloom, "The Problem of Strabismus," American Academy of Optometry Year Book, 6:81. 1931.

Guibor, "Possibilities of Orthoptic Training," Arch. of Oph., March, 1934.

Hall, "The Etiology and Treatment of Strabismus," American Academy of Optometry, Year Book, 4:90. 1929.

Higley, "Cross Eyes," 1935.

Maddox, "Ocular Muscles," 1907.

Peckham, "The Arneson Technic for the Correction of Squint," American Journal of Optometry, 5, 10:549. 1929.

Peter, "Extra-Ocular Muscles," 1927.

Sheard, "Physiological Optics," 1928.

Wells, "The Stereoscope in Ophthalmology."

Wilkinson, "Strabismus. Its Etiology and Treatment." 1927.

Worth, "Squint," 1921.

AMERICAN JOURNAL OF OPTOMETRY

Vol. 14 JANUARY, 1937 No. 1

EDITORS

DR. CAREL C. KOCH
1501 Foshay Tower
821 Marquette Avenue
Minneapolis, Minn.

DR. JACK I. KURTZ
1501 Foshay Tower
821 Marquette Avenue
Minneapolis, Minn.

Original papers, scientific communications, clinical reports, society proceedings, books for review, and correspondence should be sent to the Editor, Dr. Carel C. Koch.

Annual Subscription, $4.00 in Advance; Canada $4.50, Foreign $5.00.
Single Copies, 50c.

Copy of advertisements must be sent in by the tenth of the month preceding their appearance. Subscriptions, applications for single copies, communications with reference to advertising or other business should be addressed to the Business Manager, Dr. Jack I. Kurtz, 1501 Foshay Tower, Minneapolis, Minn.

Published Monthly by the
American Journal of Optometry Publishing Association.

The Journal has no objection to the reprinting by other magazines of any of its articles, provided such reprints are properly credited to the American Journal of Optometry.

ILLUSTRATED RECORD CHARTS IN OPTOMETRIC EXAMINATIONS

The subject of case records and how to keep them has been one which has occupied the attention of optometrists and ophthalmologists for many years, and as refractive science has improved it has been necessary to expand from time to time, the charts or cards upon which the data as developed during the refraction was to be recorded. In optometry the early cards were small affairs, largely devoted to a record of the actual material dispensed, with little or no space devoted to the recording of the findings of the refractive tests. This was natural, as the refraction of that day was based largely on the subjective test and as the prescription was the same as the final subjective finding it was useless to write it twice and therefore the record of the final prescription was all that it then seemed necessary to record. At least, if a lens were broken at some future date, it could be replaced, and when the patient did return for another examination, a glance at the card indicated to the optometrist what he had prescribed the last time the patient had called. This system, if it can be called a system, served until the skiametric and phoria and duction tests took their rightful place in refractive work. Lockwood and Cross, during the period from the turn of the Century to 1910, did much to interest the optometrists of that day in these funda-

6 months..... 1 year..... 18 months..... 2 years..... To Return.....

CASE RECORD CHART. Dr. Carel C. Koch.

Patient .....
Address .....
.....Rx No. .....Year total Rx No.....Date .....
Number of visits for examination.....Examination fee.....
Diagnosis .....
.....
Treating for.....
Number of treatments .....Treatment fee.....

PRESCRIPTION—Distance correction.

O. D. .....Sph. .....Cyl. axis..... ◯ ..... △ Prism. Base .....
O. S. .....Sph. .....Cyl. axis ..... ◯ ..... △ Prism. Base .....
Bifocal Addition: O. D.....O. S.....O. U.....
Reading correction.
O. D. .....Sph. .....Cyl. axis ..... ◯ ..... △ Prism. Base .....
O. S. .....Sph. .....Cyl. axis ..... ◯ ..... △ Prism. Base .....
Special correction for .....
O. D. .....Sph. .....Cyl. axis ..... ◯ ..... △ Prism. Base .....
O. S. .....Sph. .....Cyl. axis ..... ◯ ..... △ Prism. Base .....
Instructions to patient.....
.....
Patient referred to ..... for material. Dispensed by.....
Date patient returned with material to have it checked.....
Comment .....

CASE HISTORY

Occupation Age

Hobbies

Symptoms and comments

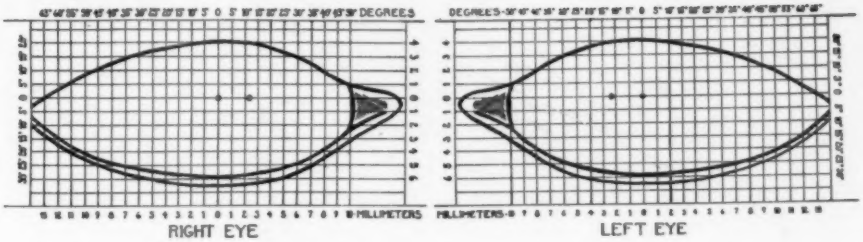
PREVIOUS CORRECTION

In use.....years, for.....Prescribed by.....
O. D.....Sph.....Cyl. axis..... ◯ ..... △ Prism. Base.....
O. S. .....Sph.....Cyl. axis..... ◯ ..... △ Prism. Base.....
Addition: O. D.....O. S.....Bifocal Type.....
Remarks .....

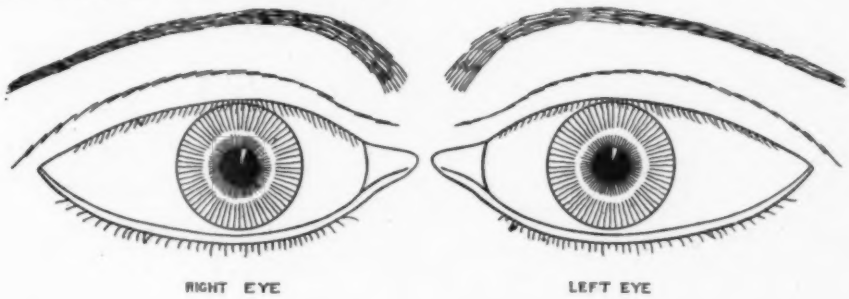
VISUAL ACUITY UNCORRECTED

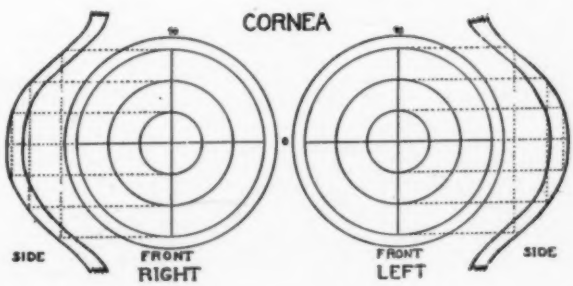
O. D. ..... O. S. ..... O. U. .....

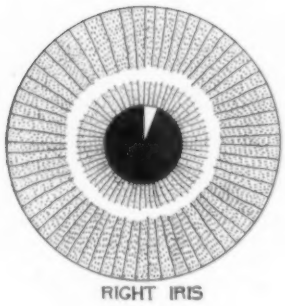
COVER TEST



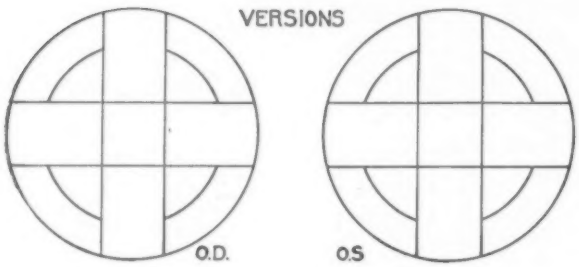
EXTERNAL OCULAR INSPECTION



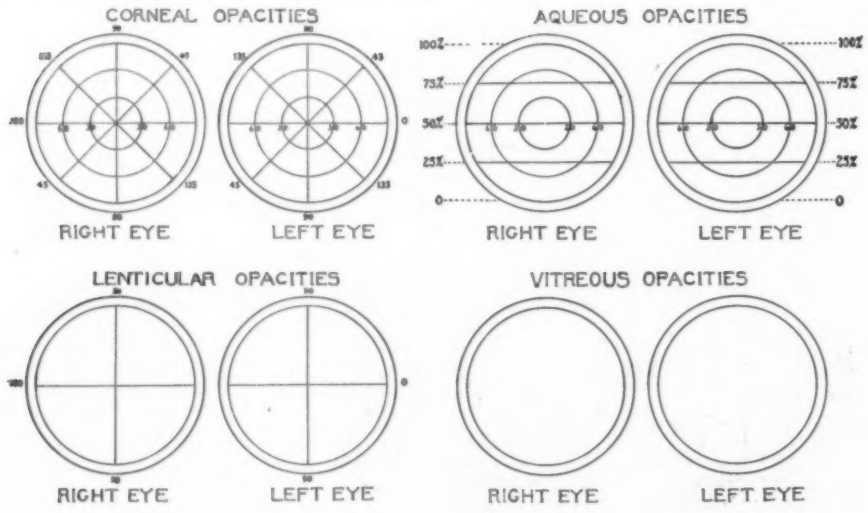


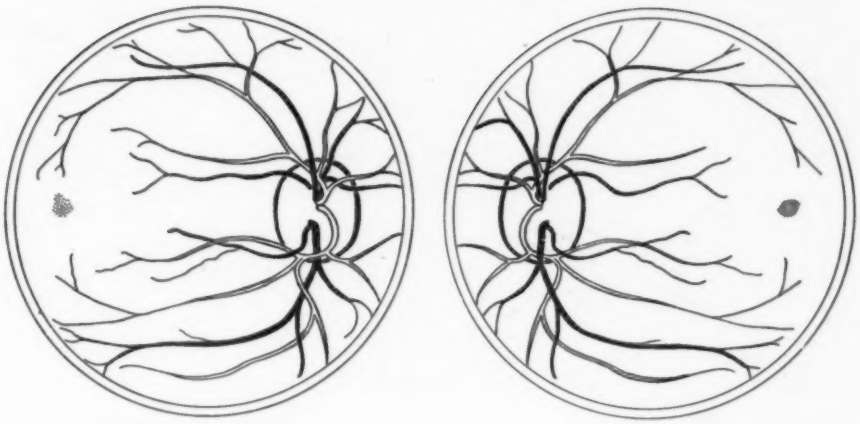


Pupil
Size O. D.....
Size O. S.....
Response to light
O. D.....
O. S.....
Response to accommodation
O. D.....
O. S.....



OPHTHALMOSCOPIC EXAMINATION





RIGHT EYE LEFT EYE

TRANSILLUMINATION
Right frontal sinus .....
Left frontal sinus .....

UNCORRECTED PHORIA TEST AT 33 cm. Time taken .....
Esophoria ..... Exophoria .....

ISHIHARA COLOR BLIND TEST
Plates read improperly. Numbers .....
.....
Color vision diagnosis .....
.....

EDRIDGE-GREEN ANALYSIS OF COLOR EDUCATION
Results of tests 1 to 5 .....
.....
See attached chart No. .....

UNCORRECTED PHORIA TEST AT 6 METERS. Time taken .....
Esophoria ..... Exophoria .....

OPHTHALMOMETRIC FINDINGS
O. D. Meridian Measured ..... Dioptic Power .....
Meridian Measured ..... Dioptic Power .....
Resultant Corneal Astigmatism ..... Dioptres, Axis .....
O. S. Meridian Measured ..... Dioptic Power .....
Meridian Measured ..... Dioptic Power .....
Resultant Corneal Astigmatism ..... Dioptres, Axis .....
Radius of Cornea in m/m with the Universal Ophthalmometer in secondary position when no astigmatism has been registered: O. D. ..... O. S. .....

SKIAMETRY, STATIC
Operating Distance ..... Reflex .....
O. D. ..... Sph. ..... Cyl. Axis .....
O. S. ..... Sph. ..... Cyl. Axis .....

THE FIRST DYNAMIC SKIAMETRIC CHECK TEST
Fixation at ..... Reflex .....
O. D. ..... Sph. ..... Cyl. Axis .....
O. S. ..... Sph. ..... Cyl. Axis .....

SUBJECTIVE TEST AT 6 METERS
O. D. ..... Sph. ..... Cyl. axis ..... Visual Acuity, 20/ .....
O. S. ..... Sph. ..... Cyl. axis ..... Visual Acuity, 20/ .....

DOMINANT EYE TEST
O. D. ..... O. S. .....

DISTANCE COMPARISON TEST
Results: O. D. ..... O. S. .....

PATIENTS VISUAL WORKING RANGE ..... inches

NEAR-POINT OF ACCOMMODATION
O. D. ..... O. S. ..... O. U. .....

SUBJECTIVE POSITIVE ACCOMMODATIVE TEST
Amplitude: O. D. ..... O. S. ..... O. U. .....

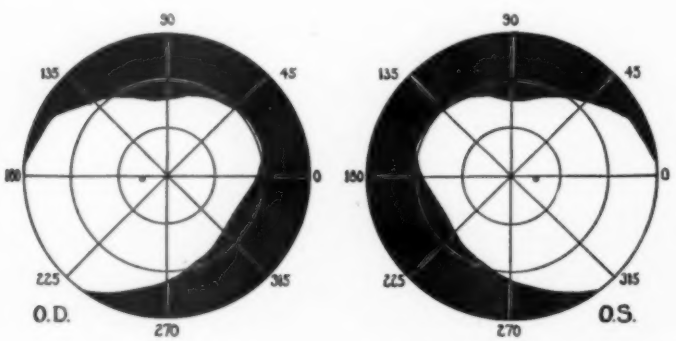
SUBJECTIVE TEST AT 33 cm.
O. D. ..... Sph. ..... Cyl. axis ..... Chart No. .....
O. S. ..... Sph. ..... Cyl. axis ..... Chart No. .....

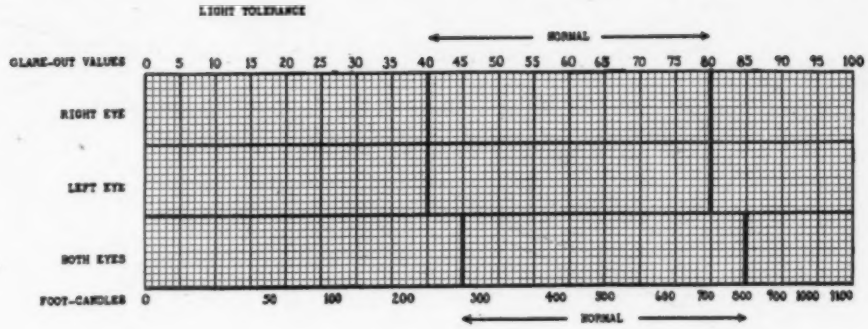
Notations regarding Post-Refraction .....
.....

POST REFRACTION Date .....

BLOOD PRESSURE
Systolic ..... Diastolic ..... Pulse Pressure .....
Advice to patient ..... Time taken .....

VISUAL FIELDS





CORRECTED DISTANCE PHORIA TESTS Time taken .....
Esophoria.....Exophoria.....R. Hyperphoria.....L. Hyperphoria.....

DISTANCE DUCTION TESTS
O. D. Abd...../.....Add...../.....Infra...../.....Super...../.....
O. S. Abd...../.....Add...../.....Infra...../.....Super...../.....

EDRIDGE-GREEN ANAYLSIS OF COLOR EDUCATION
Results of tests 6 to 10.....
.....

CORRECTED NEAR-POINT PHORIA TESTS
Esophoria.....Exophoria.....R. Hyperphoria.....L. Hyperphoria.....

NEAR-POINT DUCTION TESTS
O. D. Abd...../.....Add...../.....Infra...../.....Super...../.....
O. S. Abd...../.....Add...../.....Infra...../.....Super...../.....

SKIAMETRY, STATIC
Operating Distance..... Reflex .....
O. D.....Sph.....Cyl. Axis .....
O. S. .....Sph.....Cyl. Axis.....

THE SECOND DYNAMIC SKIAMETRIC CHECK TEST
Fixation Distance..... Reflex .....
O. D.....Sph.....Cyl. Axis.....
O. S. .....Sph.....Cyl. Axis.....

THE CORRECTED SUBJECTIVE DISTANCE ACUITY OF VISION TEST
O. D.....Sph.....Cyl. Axis.....Visual Acuity, 20/.....
O. S. .....Sph.....Cyl. Axis.....Visual Acuity, 20/.....

DIAGNOSIS

PROGNOSIS

INSTRUCTIONS TO PATIENT

mentals, and while we no longer believe just as they then did on some very vital matters, their splendid educational work proved to be the foundation upon which additional fine work could be built by the many educators who followed them and who did much in developing the profession to its present high level.

With the advent of dynamic skiametry, and with a better understanding of the value of the phoria and duction findings, it became obviously necessary to enlarge or re-arrange the record card, as the prescription which was finally prescribed was no longer the result of only the subjective test, but was rather developed as the result of several findings which all contributed something to the general result. Therefore if one wished to know, at some future date, just how that final result was arrived at, it was necessary to record in some fashion the findings of various tests as they were made during the refractive routine. This naturally brought about the development of record cards with spaces upon them for the recording of certain findings, the data at first all being crowded onto one side of the card and later on with both sides being utilized.

It is interesting to realize that it was the development of some of these early record charts or cards which actually brought into being, some of the now popular refractive systems. To be sure, the chart had nothing to do with the advanced knowledge of refractive procedure which such men as Sheard, Wiseman, Bestor, Ryer, Robinson and others were then placing before the profession, but the charts developed by them and others, were accepted by the profession as a whole as the proper sequence of refractive procedure, and the refractive tests were made in the order in which these educators happened to place them on their charts. It is actually true that many optometrists thought that the tests had to be made in exactly the order the chart specified to be of value, which as everyone knows who has given the matter any thought at all, was not either the intention of the author of these original charts, nor was it essential for the success of the examination. To be sure, a chart was later developed by Skeffington[10], Lesser[7] and others in which the actual sequence of refractive procedure did become a factor in the final result, this being due to a system of numbering the tests themselves and a method of making deductions from the refractive findings which utilized these numbered tests in a system known as Case Typing. Walker[11] presented this fully before the American Academy of Optometry, his report being subsequently published in full in this JOURNAL. However, here too, the numbers and the sequence were actually of small importance as the deductions which were advised, were, in the main, those already in use as developed by the previously mentioned educators.

A review of optometric literature shows a gradual development and improvement in preparing record charts and making these of future value in case studies. Sheard[9], Hoffman[2], Beyhan[1] and the writer[4, 5], to mention but a few, have all contributed something towards making these record charts more complete, but as the writer said last month[6], as these

charts grew and as their actual type content increased, they lost something in becoming less and less flexible. In attempting to rectify this lack of flexibility the writer suggested illustrating case records where necessary, and also perhaps the use of graphs where these would be simpler than the use of figures. This last suggestion was first made to the writer's knowledge by Horton[3]. Since the publication of the December issue of the AMERICAN JOURNAL OF OPTOMETRY the writer has received so many requests for a copy of the six page record chart mentioned by him that I have had it reproduced in full with this paper.

This six page reproduction is slightly smaller than my original but contains all of the matter on the original chart. It will be noted that considerable space is devoted to illustrating, over these original drawings, of abnormalities which may exist, this chart being different in this main particular from its predecessor[5] which was published in full in this JOURNAL in 1930. This chart, I realize, will not satisfy many optometrists on several counts, the first being as Robinson[8] points out, each chart should have provision for orthoptic treatment work findings, as well as providing space for the addition of further data as the patient returns for subsequent work. The writer considered Robinson's suggestion, in developing this chart, but preferred rather to use a new chart on each case as each new refraction was made. As far as orthoptic treatment work is concerned, the writer uses a supplementary record sheet made up especially for these particular cases. The second fault many optometrists will find with this chart is that no space is provided for notations regarding the material which has been prescribed. The reason for this is that the writer does no dispensing and therefore needs none of this data.

I am not presenting this chart as the last word in this field nor am I suggesting it as a perfect chart. It was not my original intention to present it at all, but the many requests already referred to seem to indicate that there is some interest in the matter of illustrated charts and for this reason it is herewith presented. No doubt every optometrist interested in illustrating his records will be able to devise his own chart which will suit his personal uses far better than the one now presented with this article, but may at the same time get ideas and suggestions which may be of value from this, and if so is welcome to them.

Carel C. Koch.

BIBLIOGRAPHY

1. Beyhan, P. J. A new Record Card. The Canadian Optometrist. Vol. VIII, No. 1, pp. 25-26. 1926.

2. Hoffman, A. C. A new Record Card. Northwest Journal of Optometry. Vol. 1, No. 10, pp. 262-265. 1924.

3. Horton, Hammond S. Graphical Record Charts. American Journal of Optometry. Vol. 9, No. 8, pp. 284-287. 1932.

4. Koch, Carel C. Ophthalmoscopic records. American Journal of Optometry. Vol. 7, No. 3, pp. 170-171. 1930.

5. Koch, Carel C. An Optometric Record Chart. American Journal of Optometry. Vol. 7, No. 5, pp. 293-300. 1930.

6. Koch, Carel C. Illustrated and Graphic Record Charts. American Journal of Optometry. Vol. 13, No. 12, pp. 464-471. 1936.

7. Lesser, S. K. Fundamentals of Procedure and Analysis in Optometric Examination. Published by the author, Texas National Bank Building, Fort Worth, Texas. P. 69. Second edition. 1933.

8. Robinson, S. H. Multiple Record Chart. American Journal of Optometry, Vol. 2, No. 6, pp. 158-162. 1925.

9. Sheard, Charles, Dynamic Skiametry. Published by the Cleveland Press. Chicago, Ill. pp. 96-97. 1920.

10. Skeffington, A. M. Post Graduate Lectures of the New York Optometric Society and the Brooklyn Optometric Society. Published by J. Robinson Cohen and William Feinbloom. New York City, N. Y. pp. 105-106. 1930.

11. Walker, R. N. A method of Optometric Quantitative Analysis by certain interpretations of the findings from a routine examination. Vol. VII. American Academy of Optometry. Published by the American Journal of Optometry. Minneapolis, Minn. pp. 172-198. 1933.

CORRESPONDENCE

DISCUSSION OF LENS EFFECTIVITIES OF DISTANCE CORRECTIONS AT DIFFERING NEAR-POINTS*

Ernest Petry, Opt.D., F.A.A.O.[1]
Rochester, New York
and
James O. Baxter, Jr., Opt.D.[2]
Fayetteville, N. C.

Ernest Petry to Editor

The Number One article in the November, 1936 issue of the AMERICAN JOURNAL OF OPTOMETRY is just a little too positive in the statement of a conclusion that is not on the side of fact to permit my allowing it to stand without challenge.

I was attracted by the very elaborate and admirable technique of this article by Doctor James O. Baxter, Jr., on the subject which has been a hobby of mine for the past 20 years, but when he indicated that minus additions are required for near application by eyes that are corrected with plus lenses for distance seeing, so that normal accommodative activity might prevail, he invited my scrutiny.

---

*Being a suggestion by Dr. Petry and a reply by Dr. Baxter regarding an article entitled, "Calculations indicating the various effectivities of Distance Corrections at Differing Near-Points, d being constant," by Dr. J. O. Baxter, Jr., which appeared in the American Journal of Optometry, Vol. 13, No. 11, pp. 401-409. 1936.

[1] Submitted for publication Nov. 27, 1936.

[2] Submitted for publication Nov. 30, 1936.

His attention should be called to the first half of my article that appeared in Volume VI, 1931 of the American Journal of Optometry entitled "The Relationship between Horizontal and Vertical Phoria Measurements." In this article I developed the necessary formulae and presented a table of both the spheric and prismatic additions required for normal accommodation and convergence application through correcting lenses for a 16-inch object distance.

This table indicated that approximately a plus .12 diopter addition was required for each diopter of the plus correcting lenses for normal accommodative activity, and that a minus .12 diopter was required for each diopter of the minus corrections.

In analyzing the method employed by Baxter in arriving at his conclusions the first fault appears to rest in his not having differentiated between true and vertex diopter values and in the ignoring of the varying position of the principal planes of correcting lenses. He also fails to differentiate between the object distance from the lens and that measured from the cornea.

His principal error, however, is in his assumption that the variation in the accommodative requirement is based on the difference in the values of the image pencil of light as noted in the plane of the lens and that noted in the plane of the cornea.

The only reasonable method of calculating the accommodative requirement is to determine the difference in the dioptral values of the image pencils of light, received by the eye, which originate from an object at infinity and from an object at an assumed near distance, respectively.

He also draws the false conclusion that it is impossible to provide bifocals, other than the obsolete cemented type, to accomplish the essential difference in astigmatic correction for distance and near. If based on the availability of such lenses he is, in a measure, correct because they are not at present included in the general assortment of lenses offered by the manufacturers.

However, the writer, in his private practice, has provided several pairs of lenses of the Panoptik type with toric surfaces on the segment side to accomplish what Baxter claims to be impossible. The primary reason for using the Panoptik type of bifocal was based on the fact that by their use the segment shape is not altered. The only reason for considering the project impractical is that in some prescriptions it was found necessary to use two toric surfaces.

I am sending Doctor Baxter a copy of this letter together with a copy of the reprint of the article which appeared over my signature in your Journal in 1931. Hoping that you will accept these observations on the basis of information rather than critcism, I am

ERNEST PETRY

CARE BAUSCH & LOMB OPTICAL CO.
ROCHESTER, N. Y.

James O. Baxter, Jr., to Editor

While I am aware that many calculations could be included that would incorporate other variables than the ones I considered essential to my discussions, I do not believe that such a procedure would be justified since it would make the paper an inextricable maze of higher mathematics that would tend to overshadow the clinical significance of the conclusions. That the inclusion of *all* variables would make the final results more nearly exact goes without saying; that it would enhance the value of the paper is debatable, in my mind. That the formulae I used are true equations may be established nearly as readily as the multiplication tables; I hold them to be self-evident. Since, however, the tables derived from them are not intended to be used in the most exact clinical sense, but rather to point the way to what might be expected from a reading-point test, which I have insisted should be made *to corroborate what I would expect them to be*, I hold that any criticism such as has been offered is superficial, though valid.

Perhaps the expression "impossible" is a bit strong, if so let us substitute "most impractical" when discussing variations of cylinder *in the segment alone*. I'll admit readily that I was of the opinion that it was impossible, but then, in the final analysis, maybe all things are possible —*if we know how*. I should be glad to hear more about this.

If, as a result of all of this, the members of the profession are made aware of the existence of a major problem that has been largely ignored in the past, the purpose of my paper will have been served. Petry fails to point out that we agree on one thing, wholeheartedly: that the problem exists, and has not been treated properly, or even recognized by and at large, as a problem. With this, allow me to conclude. I shall be happy to hear your personal reaction to the point under discussion, and the criticism offered.

James O. Baxter, Jr., to Ernest Petry

This is to thank you for your kind letter of the 27th in which you point out certain deficiencies in recent calculations made by me as to varying lens effectivities. I await with great interest the tables and calculations made by you dealing with this most interesting subject.

That certain error and partial failure in an exact mathematical sense should creep into calculations of this sort was a foregone conclusion. I frankly admit that I was seriously handicapped in this work by the nonuse of the calculus, which tool I have allowed to become rusty from neglect since undergraduate days. The methods employed by me in the development of the tables of adds and effectivities are, in a scientific sense, no more original with me than a table of logarithms. These tables were not, however, intended to be used as an exact chart for clinical procedure but rather to indicate the manner in which certain variables would behave under given circumstances, and to point the way for further clinical investigation (i.e., complete near-point examinations, as are commonly made only at a distance of twenty feet).

That the subject has not been exhausted will be apparent to all interested; indeed, I might state the conviction that the surface has been hardly scratched in work of this sort, and that the need for further treatment of like problems cries to high heaven. A most important fact is that the very existence of such problems is, most often, not recognized by the profession, and any technical paper that I have written or might write in the future has been laboriously worked out with the idea foremost of calling the attention of the (relatively few) thinking optometrists to the solution of such problems which might not have existed in their several minds *as problems*. If my recent paper serves to this end, I will feel more than repaid for the months of work spent on it; it is my reasoned conviction that a more exhaustive discussion of the problem and the properties of the curves engendered would have overshot the mark, resulting in further neglect of a vital constant. I bring out this thought in order that I may be judged by my objectives rather than by my accomplishments, which latter will of necessity be faltering and include many part-truths and minor errors.

JAMES O. BAXTER, JR.

305-307 HUSKE BLDG.
FAYETTEVILLE, N. C.

ABSTRACTS

THE CORRECTION OF ANISEIKONIA WITH OPHTHALMIC LENSES. By Kenneth N. Ogle, The Department of Research in Physiological Optics, Dartmouth Medical School. The Journal of The Optical Society of America, Vol. 26, No. 8, August, 1936. (Ithaca, N. Y.)

Up to the present paper, the publications of the Dartmouth group who for several years have been investigating the problems of Aniseikonia, or Unequal Sized Ocular Images, have discussed the problem itself with methods of measurements and descriptions of apparatus and technics, but with little definite information as to the making of the correcting lenses. In this paper are developed the formulae for the construction of eikonic lens corrections. Hence, it is welcome to the practitioner who realizes the importance of the problem in refraction and the frequency with which it is encountered in every day practice.

Through a series of equations the author develops the formulae for the relation of retinal image size to the object for clear imagery and for blurred imagery and for determining the magnification properties of a single ophthalmic lens. In this series, therefore, appears the formula for computing the magnifications effected by making lenses of various curvatures and thicknesses, thereby producing eikonic, or size, corrections to-

gether with the refractive corrections in single lenses for the less complex cases of aniseikonia.

The next step is the formulation of the ratio, or difference, between the computed retinal image sizes, together with the equation in which appears the size magnification of one lens necessary to produce equality of magnification for the two eyes.

These formulae are based on the paraxial bundle of rays (with the unstated assumption that this entering bundle is co-incident with the visual axis and the correlative assumptions that the images are formed in the central foveas of both eyes and on identical points, which assumptions have been specifically stated in previous publications of the Dartmouth group) and the assumption of constant indices of refraction for the various media. Both these assumptions are essential to a theoretic computation of retinal image sizes. Dr. Ogle does not directly mention possible variations of refractive indices, which cannot be measured in living eyes but which would tend to modify image sizes. But such variations would have little or no clinical significance, since the tests for size differences and size equalizations are subjective.

The actual measurement is of the difference in interpreted sizes, or differences of the ocular images, not of the retinal images themselves which cannot be directly measured. As Dr. Ogle points out, "The actual procedure in making the measurements in the clinical instrument, of course, consists in modifying the ratio of magnifications of the test lenses by means of special size lenses which are added before one or the other of the eyes until the images appear equal." When this magnification ratio is thus found, the formulae based on the schematic eye become useful for computing the surfaces and thickness of the combined refractive and size correction in the final ophthalmic lens to be worn. To repeat these formulae and their derivation in this abstract would mean the reprinting of almost the entire original paper. Therefore the interested reader is advised to turn to that source for the formulae.

The intricate problems of making the trial case lenses equivalent to the single spectacle lens are given considerable attention and formulae for the vergence and magnifications of two element lens systems are given. The excess magnifications of cylindrical lenses are discussed and the author says that "In most of the trial cases manufactured today the cylinder powers are additive." But he fails to add, perhaps is not aware of the fact, that at least 99% of the trial cases to be found in refractionists' offices today are antiques, in which neither spheric nor cylindric powers are additive. He remarks, "The vergence powers of the ophthalmic lenses and the vergence powers of the trial case lenses must be identical in all meridians," and "The vergence powers of the two lenses must be the same." To this I would add, But they seldom are. In the manufacture of ophthalmic lenses, art lags a long way behind science.

"The magnifications needed in the test instrument to equalize the sizes of the ocular images are not a simple measure of the aniseikonia

present because of the magnification properties of the test lenses. These magnifications are unavoidable and are variable and of considerable magnitude. . . A redesign of the trial case lenses may simplify these magnifications." Again, "This quantity, designated as the cylindrical excess magnifications, depends only upon the particular trial case cylinder used. It is an unwanted magnification factor which may artificially create a difference in size between the ocular images in the power meridian of each cylindrical trial case lens used. The eikonic ratio as determined in the clinic cannot then indicate the true aniseikonia. Under certain circumstances it is possible to design a trial case system the use of which would eliminate this factor." The discussion of these matters is definite, illuminative and constructive.

Another problem is the exactness of correction of the ametropia. From the discussion and mathematical formulae, we infer how inaccurate correction may produce an artificial aniseikonia or exaggerate a true aniseikonia. The author points to two types of blur: That resulting from physiological phenomena because of which sharp imagery is impossible; that due to inexact correction of the refractive error. "In practice, it is difficult to determine whether or not the images on the retinas are actually sharp. Moreover, to what extent an image can be blurred and good acuity still be obtained or what effect the blurring itself has upon the retinal image is somewhat indeterminate." Therefore, considerable attention is given to the matter of blurred imagery and the aniseikonic problems therein resultant.

Perhaps the most useful part of the paper to the average practitioner is the table giving the dioptric surfaces and thicknesses of a set of 16 trial lenses of different magnifications with negligible vergence, or dioptric, power. We list a few of these as illustrative of the method of size magnification. Such lenses can be worn in fit-over rims attached to spectacles.

Lens No.	Magnification 75 cm.	Front Surface Diopters	Rear Surface Diopters	Thickness mm.	Vergence Power at 6 M. Diopters
1	0.25%	+ 2.43	— 2.43	1.20	+0.01
4	1.00%	+10.17	—10.24	1.39	+0.02
8	2.00%	+11.03	—11.18	2.55	+0.05
12	3.00%	+11.49	—11.73	3.65	+0.07
20	5.00%	+12.20	—12.64	5.66	+0.12

Eikonic lens corrections are now made by the American Optical Co. Dr. Ogle gives credit to Dr. Tillyer for assistance in the technical work of producing the lenses.

Probably the average refractionist will find the mathematical part of this paper rather tough going. But without its mathematics, the paper is replete with practical information on the problems of iseikonic correction. To the reviewer it has been the most directly helpful of anything which has appeared on this subject, and the most practically useful of any paper dealing with refractive and office practice of the past year.

Ray Morse-Peckham.

BOOK NOTICES

WILLS HOSPITAL EYE MANUAL FOR NURSES. Gladys Elaine Cole, R.N., Chief Nurse, Wills Hospital, Philadelphia. Published by the W. B. Saunders Company, West Washington Square, Philadelphia, Pa. 97 illustrations. 202 pages. Cloth. $1.75. 1936.

Miss Cole has written a well developed manual for the use of nurses and others who may be called upon to assist the surgeon in his work on eye cases. The book is written for assistants who are not trained in ocular work and who will therefore find much of value between its covers, as the entire field of the general care of eye cases is covered. Starting with a brief review of ocular anatomy and physiology Miss Cole takes the reader through the necessary pre-operative care, the work to be done to assist the surgeon during the operation and the post-operative care of the patient. Cases which require treatment attention are also considered and the work to be done by the assistant is fully gone into. In addition to these matters the author also gives considerable space to the important matter of ocular refraction and the work to be done in this field and that of orthoptics by the assistant to the refractionist. Here the optometrist's assistant also would find this book of value as many office girls who now help optometrists lack much in their knowledge of eyes which this fine little volume would correct. C. C. K.

* * * * *

THE FUNDAMENTALS OF CHROME-ORTHOPTICS. Wm. Henning, Opt.D., F.A.A.O. Published by Actino Laboratories, 429 N. Superior St., Chicago, Ill. Paper cover, 50 pages. 1936.

In this monograph Dr. Henning tries to point out the important effect of light on the human body in general and upon the eye in particular. He lays special emphasis on the effects of specific lights. He suggests that certain specific light frequencies which, for convenience, he designates as number 1 to 5 inclusive have the following properties respectively. Sensory stimulant, Physiological stabilizer, Motor stimulant, Sensory depressant, Motor depressant. A certain filter is to be used to get any specific frequency. Any number of frequencies may be obtained by combining two or more filters. The author presents a novel chart from which any one can figure out any desired combination of frequencies.

Henning devotes one chapter to the physiologic effects of specific lights, one to the effect on accommodation and another chapter to basic technique. There are several illustrations which help the reader materially in following the author's line of reasoning.

While some of the statements made by the author in this monograph are hypothetical and philosophical in nature and are not subject to laboratory proof, most of them are reasonable and are worthy of further study and consideration. J. I. K.

FRAME STYLE LEADER

the Manley

Simplicity . . . strength . . . fine appearance . . . these features make the Manley a style favorite with energetic men. Gold-filled and, like all Bausch & Lomb gold-filled frames and mountings, it is built on honor. You can trust your reputation in B & L gold-filled, secure in the confidence that your patients cannot find finer eyewear at any price.

BAUSCH & LOMB

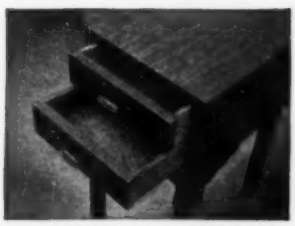
OPTICAL COMPANY • • ROCHESTER, N. Y.

WELCOME YOUR BAUSCH & LOMB DISTRIBUTOR'S REPRESENTATIVE—AMBASSADOR OF GROWTH

AT LAST—A PROFESSIONAL PIECE OF ADJUSTING EQUIPMENT

The New Dieman Adjuster's Desk

Here is a new idea that makes dispensing easier, more comfortable and more professional and it eliminates the psychological resistance commonly associated with counters and tables. No wide barrier separates you from your patient and yet you are so cleverly seated that your legs cannot touch. A large top area provides ample room for mirrors, mat and elbows. The Dieman Adjuster's Desk—a definite advance in the art of dispensing, is popularly priced. The 3-piece ensemble complete, in genuine walnut only, is $77.50. This consists of the desk as shown, and a well designed genuine walnut chair and stool, both covered in antiqued white imitation leather. Individually the pieces are priced as follows: desk $60.00; chair $11.50; stool $10.75. Be first in your community to adopt this new idea that will pay you big returns. Order your desk now!



Two roomy drawers for pliers and other necessary accessories

Room for 36 samples in three velvet padded and partitioned drawers

A Word To Wholesalers!

Be the first to offer this sensational new idea to your customers. Write for further information and discount schedules.

RIGGS OPTICAL COMPANY

General Offices—Merchandise Mart—Chicago, Illinois

Map Making from the Skies

AN AIRPLANE streaks across the sky. At intervals a shutter clicks. And on a photographic negative is recorded, rapidly and permanently, a positive record of rivers and mountains, cities and highways.

The heart of the aerial camera is its lens. The fact that the Bausch & Lomb Tessar is the lens selected by Fairchild aerial cameras is evidence of the ability of Bausch & Lomb to translate its talents to meet exacting requirements in still another of its many fields of activity.

Prosaic, perhaps, but of tremendous human importance, are Bausch & Lomb's contributions to its major field of activity—the correction of eyesight. In the Orthogon, technical knowledge and manufacturing skill are combined to produce Bausch & Lomb's best ophthalmic lens. *In Soft-Lite, too*

BAUSCH & LOMB *Orthogons*

V CHECKING UP

-- on a Few Quality Features of Shuron Frames and Mountings

FIRMFLEX—The patented "shock-absorber" spring for Shuron rimless that minimizes lens breakage and maintains correct alignment.

DUREX—The new Shuron temple for frames and mountings whose cable is absolutely proof against acid attack.

FLOATING SPRING STRAPS—These leaf-spring straps mounted at end-pieces and center, cushion rimless lenses against jars and jolts at these vulnerable points.

SCREW SEAL—The tightness of screws sealed in with Shuron Screw Seal is your safeguard against loosening lenses.

ROCKING PADS—The easy-fitting nose pads for frames and mountings that adjust readily to individual requirements.

GOLD CONTENT—Every Gold Filled Frame and Mounting made by Shuron is guaranteed to assay *at least* 45/1000 fine gold content, "exclusive of screws, dowels, cores of cable temples, and parts encased in zylonite."

• Along with the assurance of completely satisfactory wear because of these Shuron features goes the opportunity to prescribe exactly for each patient from a complete selection of frame and mounting styles.

SHURON OPTICAL COMPANY, INC.

GENEVA, N. Y.

MANUFACTURERS OF OPTICAL PRODUCTS OF "QUALITY BEYOND QUESTION"